
MONTANA DEPARTMENT OF TRANSPORTATION WETLAND MITIGATION MONITORING REPORT: YEAR 2007

*Cloud Ranch
Big Timber, Montana*



Prepared for:

MONTANA DEPARTMENT OF TRANSPORTATION
2701 Prospect Ave
Helena, MT 59620-1001

Prepared by:

POST, BUCKLEY, SCHUH & JERNIGAN
801 North Last Chance Gulch, Suite 101
Helena, MT 59601-3360

December 2007

PBS&J Project No: B43088.00 - 0502



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1.0 INTRODUCTION

This report summarizes the methods and results of the fourth year of monitoring at the Cloud Ranch project site. The Big Timber Creek stream and wetland restoration was constructed in the spring of 2003 to mitigate wetland impacts associated with proposed Montana Department of Transportation (MDT) roadway improvement projects in the Billings District - watershed #13. The site is located in Sweetgrass County approximately twelve miles northwest of Big Timber in Section 36, Township 3 North, Range 13 East (**Figure 1**). Elevations within the assessment area range from approximately 4840 to 4900 feet above sea level. The surrounding land uses include pastures and residential areas.

The project is intended to develop approximately 5.5 acres of wetland credit within a 15.5 acre conservation easement on private property. The project included restoration of a degraded reach of Big Timber creek by narrowing the channel and revegetating the over bank areas with riparian trees, shrubs, wetland grasses and forbs. Wetland restoration and creation activities at off-channel wetland sites included pond and embankment removal, with subsequent grading and revegetation. All disturbed areas were revegetated with native wetland species. The stream channel and off-channel wetland restoration sites are shown on **Figure 2** in **Appendix A**.

The 2003 baseline wetland delineation conducted by Aquatic Design and Construction Inc. (ADC) identified 1.00 acre of wetlands within the project area (**Appendix D**). The Corps of Engineers (COE 2002) approved allocation of 1:1 credit ratio for creation and restoration, as well as 4:1 ratio for the maintenance of a buffer zone around the wetland and riparian areas. More specifically, the wetland credit breakdown approved by the COE is as follows: 0.61 acre for off-channel wetland creation, 1.41 acres for off-channel wetland restoration, 2.0 acres for riparian wetland restoration along Big Timber Creek, 0.58 acre for emergent wetland restoration along Big Timber Creek, and a 0.89 acre upland buffer (4:1 ratio) for a total of 5.5 acres. The summary table of potential wetland credits available for the Cloud Ranch is outlined in the 2002 COE letter (**Appendix G**).

Wetland restoration and creation activities resulted in the temporary disturbance of 0.03 acre of existing wetlands. For the purposes of the report, each area (off-channel wetlands and Big Timber Creek) is addressed separately, but the acreages are tallied as one site.

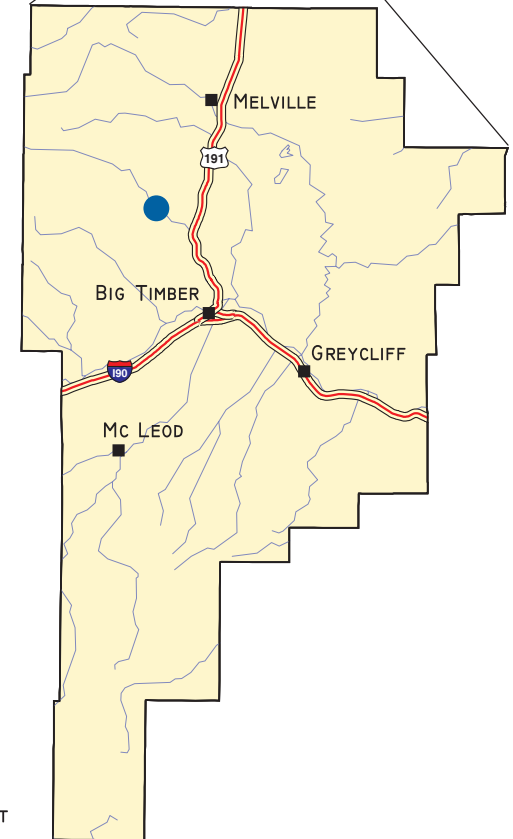
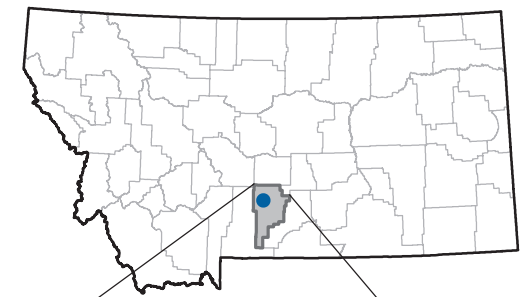
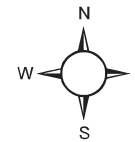
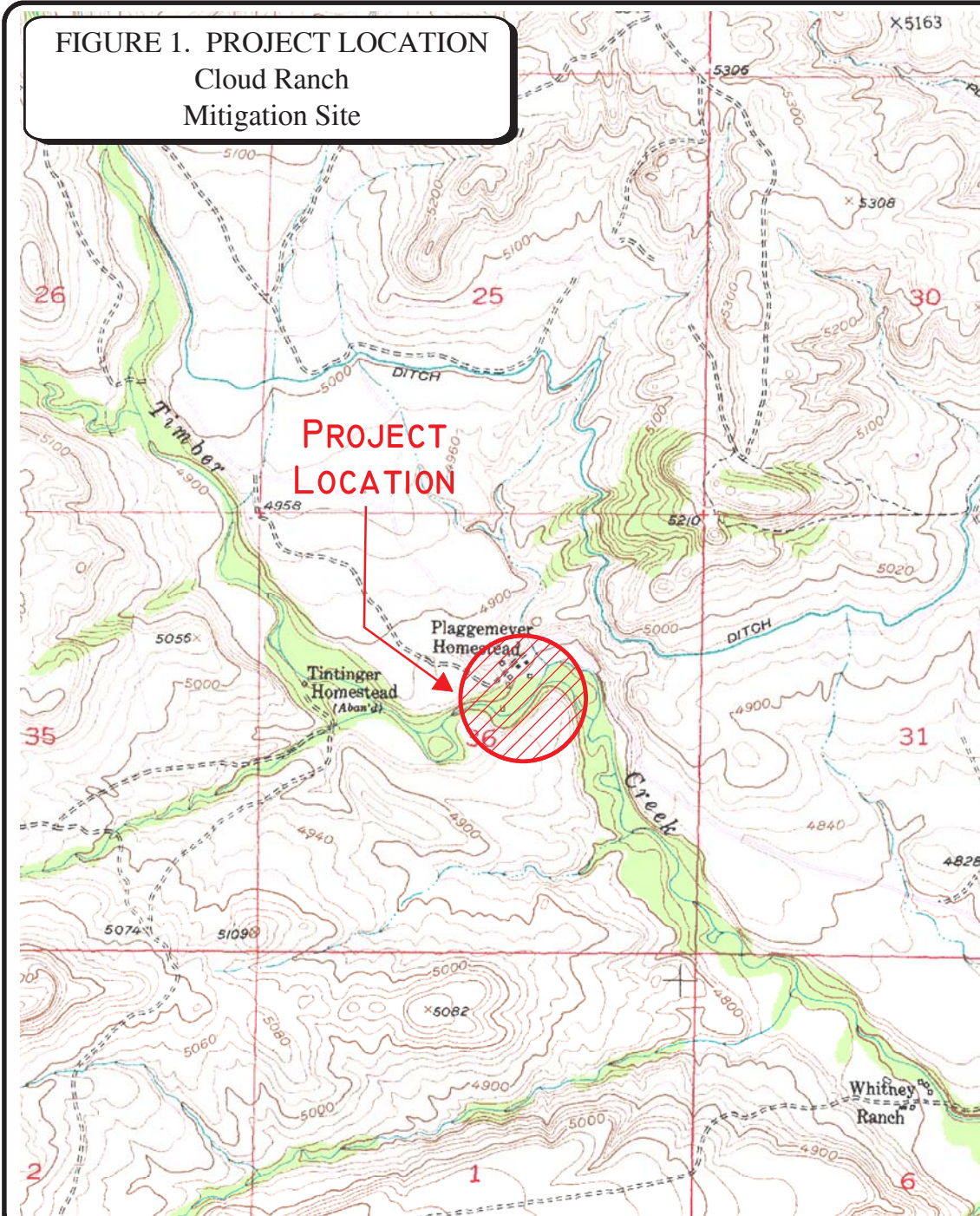
2.0 METHODS

2.1 Monitoring Dates and Activities

The project site was monitored on July 24, 2007. Activities and information conducted/collected during the monitoring event included: wetland delineation; wetland/open water boundary mapping; vegetation community mapping; survival of planted woody vegetation, vegetation transects; soils data; hydrology data; bird and general wildlife use; photograph points; macroinvertebrate sampling; functional assessment; and maintenance needs (**Appendix B**).

FIGURE 1. PROJECT LOCATION

Cloud Ranch
Mitigation Site



0 800 1,600
FEET
1:24,000

PROJECT #: 330054.504
DATE: JAN 2005
LOCATION:
PROJECT MANAGER:
DRAWN BY: B. STEINEBACH

LAND & WATER CONSULTING
PO Box 239
Helena, MT 59624
A Division Of **PBS**

2.2 Hydrology

Wetland hydrology indicators were recorded using procedures outlined in the COE 1987 Wetland Delineation Manual (Environmental Laboratory 1987). Hydrology data were recorded on the COE Routine Wetland Delineation Data Form (**Appendix B**) at each wetland determination point. Precipitation data for the year 2007 were compared to the 1894-2007 average (WRCC 2007).

All additional hydrologic data were recorded on the mitigation site monitoring form (**Appendix B**). The boundary between emergent vegetation and open water was mapped on the aerial photograph (**Figure 3** in **Appendix A**). There are no groundwater monitoring wells within the assessment area.

2.3 Vegetation

General vegetation types were delineated on the aerial photograph during the July site visit (**Figure 3** in **Appendix A**). Coverage of the dominant species in each Community Type is listed on the Wetland Mitigation Site Monitoring Form (**Appendix B**). A comprehensive plant species list for the entire site was compiled. Observations from past years were compared with new data to document vegetation changes over time. The assessment area is fenced and woody species were planted along the creek. Qualitative observations were used to assess the survival of the planted woody species. The visual assessment included written estimates of species survival along the transect length as well as the stream channel and floodplain.

Two transects were established during the 2004 monitoring event to represent the range of current vegetation conditions. These transects were re-evaluated in 2007 to reflect changes in species composition and changing wetland boundaries. These transect locations are shown on **Figure 2** in **Appendix A**. The percent cover for each species was recorded on the Wetland Mitigation Site Monitoring Forms (**Appendix B**). Each transect is used to evaluate changes over time, especially the establishment and increase of hydrophytic vegetation. Transect ends are marked with metal fence posts and their locations recorded with the GPS unit. Photos of each transect were taken during the July visit.

2.4 Soils

Soils were evaluated during the mid-season visit according to the procedure outlined in the COE 1987 Wetland Delineation Manual. Soil data were recorded for each wetland determination point on the COE Routine Wetland Delineation Data Form (**Appendix B**). The most current terminology used by NRCS was used to describe hydric soils.

2.5 Wetland Delineation

A wetland delineation was conducted within the assessment area according to the 1987 COE Wetland Delineation Manual. Wetland and upland areas within the monitoring area were investigated for the presence of wetland hydrology, hydrophytic vegetation and hydric soils. The information was recorded on the COE Routine Wetland Delineation Forms (**Appendix B**). The

indicator status of vegetation was derived from the National List of Plant Species that Occur in Wetlands: Northwest Region 9 (Reed 1988). The wetland/upland and open water boundaries were mapped onto 2004 aerial photos in the field and used to calculate the wetland areas developing at the Cloud Ranch. A pre-construction wetland map was completed by the Aquatic Design and Construction (2003) and is included in **Appendix D**.

2.6 Mammals, Reptiles, and Amphibians

Mammal, reptile, and amphibian species observations were recorded on the Wetland Mitigation Site Monitoring Form during the summer visit (**Appendix B**). Indirect use indicators were also recorded including tracks, scat and burrows. A comprehensive wildlife species list for the entire site was compiled and is updated as new species are encountered.

2.7 Birds

Bird observations were recorded during the July 24th site visit according to the established bird survey protocol (**Appendix E**). A general, qualitative bird list has been compiled using these observations.

2.8 Macroinvertebrates

Two macroinvertebrate composite samples were collected during the site visit following the Macroinvertebrate Sampling Protocol (**Appendix F**). Samples were collected from the existing wetland pond located in the northeast corner of the project site and from Big Timber Creek. The samples were preserved as outlined in the sampling procedure and sent to Rhithron Associates for analysis. The approximate sampling locations are indicated on **Figure 2** in **Appendix A**. Results are included in **Appendix F**.

2.9 Functional Assessment

A functional assessment form was completed for the site using the 1999 MDT Montana Wetland Assessment Method (Berglund 1999). Field data necessary for this assessment were collected on a condensed data sheet. The remainder of the assessment was completed in the office. Pre-construction functional assessments were completed by ADC but have thus far not been received for use in monitoring reports. For each wetland or group of wetlands (that share similar functions and values) a Functional Assessment form was completed (**Appendix B**).

2.10 Photographs

Photographs were taken showing Big Timber Creek riverine wetlands, the off-channel wetland areas, the monitoring area, and the vegetation transects (**Appendix C**). A description and compass direction for each photograph were recorded on the wetland monitoring form.

During the 2004 monitoring season, each photograph point was staked and the location recorded with a resource grade GPS. The approximate locations are shown on **Figure 2** in **Appendix A**. All photographs were taken using a digital camera.

2.11 GPS Data

During the 2004 monitoring season, survey points were collected using a resource grade Trimble Geoexplorer III hand-held GPS unit (**Appendix E**). Points collected included: the beginning and end locations of the vegetation transects, the wetland boundary, and the sample point (SP) locations. In addition, GPS data were collected for four (4) landmarks recognizable on the air photo for purposes of line fitting to the topography. In 2004, the wetland delineation boundary was recorded on an aerial photo along the creek channel where GPS signals were unattainable. No additional GPS data were collected in 2007.

2.12 Maintenance Needs

The condition of water level control structures, weed infestation, or other mitigation related structures was evaluated. Minor maintenance needs and recommendations are provided in Section 3.9. This examination did not entail an engineering-level analysis.

3.0 RESULTS

The project includes two different and distinct wetland areas; the Big Timber Creek channel restoration and the off-channel creation/restoration wetlands within the upland terraces south of the stream channel. Information pertaining to each type of mitigation is summarized below.

3.1 Hydrology

Big Timber Creek

The Cloud Ranch reach of Big Timber Creek is located approximately one mile below the confluence of the South Fork of Big Timber Creek and the main stem of Big Timber Creek. The existing braided creek channel was reconstructed to a single channel consistent with an upstream reference reach. The over-bank areas of the new channel are beginning to revegetate with riparian shrubs and trees and herbaceous wetland plants. Herbaceous wetland plants are initially dominating the topographically low areas within the reconstructed bars. The over-bank substrate is well-drained, very coarse textured alluvial material. In general, the riverine wetlands associated with the creek are low point or side bars as shown on **Figure 3** in **Appendix A**.

In 2006, channel movement was observed within the re-constructed creek and floodplain. High water marks, overbank flows, and bank loss were noted. High water flows eroded deposition sediments (silts and clay) and organic matter from point bars of inside bends and wetlands mapped during 2004 and 2005 monitoring. Many of these areas have been replaced with gravels and/or cobbles. The stream has created a new channel by cutting through a small point bar/wetland. The abandoned channel is now a broad dry rocky meander (near photopoint C – **Figure 2**). Big Timber Creek channel migration resulted in minor bank loss in 2007.

In 2007, young cottonwood seedlings (*Populus angustifolia*) were abundant on the gravel bars along the upper reach of the project area. Seedlings were approximately 3 to 4 inches tall.

Cottonwoods are pioneering species that require moist, barren, newly deposited alluvium that is exposed to full sunlight. The erosional and depositional pattern of the creek helps maintain diversity of plant communities on the floodplain. Young willow seedlings and several new forbs were also noted this year within the gravel bars.

The lateral movement of the creek will continue to create terraces with varying levels and changes in vegetation. Primary hydrology indicators observed during the July 24, 2007 monitoring visit included saturation within the upper 12 inches, water marks and sediment deposits.

According to USGS data collected on the Boulder River (Big Timber station) for 2007, high daily discharge flows in May through June 2007 were approximately 3,000 cubic per second (cfs) compared to daily flows of less than 60 cfs in August through September 2007. In 2006, flows in May through June were approximately 4,000 cfs with daily flows of less than 100 cfs in August through September 2006 (USGS 2007).

The project designer, Tom Coleman (Aquatic Design & Construction), commented in 2006 that the upper reach of channel has narrowed as a result of the 2006 high flows, which is favorable. According to Mr. Coleman, the upper end of the lowest reach is likely to continue shifting before it stabilizes and some minor intervention in this area may be warranted.

Off-channel restored/created wetlands

A drained pond within an historic oxbow of Big Timber Creek was graded and revegetated with herbaceous wetland plants. The unnamed spring creek channel was originally ditched through most of the pond system. As part of the restoration activities, a new sinuous channel was developed through the wetland complex where a series of low structures were created to mimic a condition analogous to a series of abandoned beaver ponds. Three water level control structures were installed as well as several small dikes to promote inundation of the created and existing wetlands. An embankment was also removed from the pond to lower water surface levels consistent with the existing wetland area to the south. Several ponds or “over-widened” sections of the existing spring creek channel were filled and revegetated with herbaceous wetland plants. During the July 24, 2007 monitoring visit, approximately 30% of the assessment area was inundated with shallow standing water. Open water, or the area without emergent vegetation, is depicted on **Figure 3** in **Appendix A**.

According to the Western Regional Climate Center (WRCC), the Big Timber weather station has calculated a mean annual precipitation of 11.33 inches from 1894 through August 2007 (last updated file). The average precipitation through the month of July for that period was 10.06 inches. For the year 2007, precipitation through July was 11.73 inches or 116 percent of the mean indicating that the spring and summer of 2007 (through July) were wetter compared to 2006 precipitation. Montana experienced record breaking hot temperatures in July and August 2007. Even with the increase of precipitation in May and June of 2007, unseasonably hot temperatures were likely the result of lower creek levels, and reduced surface water across the off-channel wetlands.

3.2 Vegetation

Vegetation species identified on the site are presented in **Table 1**, and in the Monitoring Form (**Appendix B**). A total of eight Community Types were documented at the site, of which six are vegetated wetland types. These vegetation Community Types were identified and mapped on the mitigation areas (**Figure 3** in **Appendix A**). The vegetation types along the Big Timber Creek include: Type 1 *Bromus inermis*/*Agropyron repens*, Type 2, *Populus angustifolia*/*Agrostis alba*, Type 3, *Agrostis alba* and, Type 8, *Populus angustifolia* seedlings. Dominant species within each community are listed on the Monitoring Form (**Appendix B**). Hydrophytic vegetation communities are changing in size, diversity and cover values over time.

The vegetation types within the off-channel wetlands include: Type 4, *Juncus sp./Mixed Herbaceous Species*, Type 5, *Carex sp./Glyceria sp.*, Type 6, *Typha latifolia/Scirpus sp.* and, Type 7, *Bromus sp./Agropyron sp.* Dominant species within each community are also listed on the Monitoring Form (**Appendix B**). There are approximately 38 known species of wetland plants with a FACW to OBL status within the channel assessment area and within the off-channel wetlands.

The vegetation transect results are detailed in the monitoring form and are summarized below in **Tables 2a** and **2b**. Transect 1 is located in the upper reach of Big Timber Creek and spans from upland to upland across the channel, wetlands and floodplain (**Table 2a; Charts 1** and **2**).

The charts evaluate trends in vegetation community cover as well as the effects of the Big Timber creek flows within the project area. **Chart 1** presents the length of each vegetation community along the transect with a comparison between the past four years. **Chart 1** shows an continued increase in the wetland Community Type 2 in 2007, a reduction in the upland Community Type 1 and the initial development of Community Type 8. Factors influencing the increase in 2007 are attributed to the high flows in 2006. **Chart 2** shows the development of the wetland Community Type 8 on the gravels created during the high flows in 2006.

Transect 2 is located along the northern quarter of the off-channel restored wetlands (**Table 2b; Charts 3** and **4**). These charts show graphically the length of the different vegetation communities for the past four years. The off-channel wetland Community Type 4 represents over 93 percent of the cover along Transect 2 and has gained 78 feet since 2004. The upland Community Type 7 shows a steady reduction in the overall length since 2004.

Community Types 5 and 6 continue expanding around the north, northeast and southern perimeter of the open water pond, replacing Community Type 4. *Populus angustifolia* seedlings (2 to 3 feet tall) were observed in Community Type 7 along the north and northwestern portions of the off-channel wetlands. Community Type 3 *Agrostis alba* is replacing drier portions of Community Type 5 in the far southeast corner of the project site. *Salix exigua* was also noted along the border of the wetter Community Types (5 and 6). Community Type 5 continues to be the most diverse wetland type, with a wide variety of wetland species. Community Type 6 is expanding into areas in the far south east corner of the project site. There is little sparsely vegetated or bare soil area compared to 2005.

Table 1: 2004 to 2007 Big Timber Creek riverine and off-channel wetland vegetation species list.

Scientific Name	Region 9 (Northwest) Wetland Indicator Status ^{1, 2}	Scientific Name	Region 9 (Northwest) Wetland Indicator Status ^{1, 2}
<i>Achillea millefolium</i>	FACU	<i>Glycyrrhiza lepidota</i>	FAC+
<i>Agropyron repens</i>	FACU	<i>Grindelia squarrosa</i>	FACU
<i>Agropyron riparium</i>	(FACU)	<i>Helianthus annuus</i>	FACU
<i>Agropyron smithii</i>	FACU	<i>Hordum jubatum</i>	FAC+
<i>Agropyron trachycaulum</i>	FAC	<i>Hyoscyamus niger</i>	(UPL)
<i>Agrostis alba</i>	FACW	<i>Juncus balticus</i>	FACW+
<i>Alopecurus aequalis</i>	FACW	<i>Juncus ensifolius</i>	FACW
<i>Alopecurus arundinaceus</i>	(FACW)	<i>Juncus longistylis</i>	FACW
<i>Alopecurus pratensis</i>	FACW	<i>Juncus mertensianus</i>	OBL
<i>Ambrosia trifida</i>	FACU+	<i>Juncus tenuis</i>	FACW-
<i>Arctium minus</i>	(FACU)	<i>Juncus torreyi</i>	FACW
<i>Beckmannia syzigachne</i>	OBL	<i>Linaria vulgaris</i>	(FACU)
<i>Betula occidentalis</i>	FACW	<i>Lupinus spp.</i>	(FACU)
<i>Bromus ciliatus</i>	FAC+	<i>Melilotus officinalis</i>	FACU
<i>Bromus inermis</i>	(UPL)	<i>Mentha arvensis</i>	FACW-
<i>Bromus marginatus</i>	(FACU)	<i>Mimulus guttatus</i>	OBL
<i>Bromus japonicus</i>	UPL	<i>Phalaris arundinacea</i>	FACW
<i>Calamagrostis canadensis</i>	FACW+	<i>Phleum pratense</i>	FACU
<i>Carduus nutans</i>	(FACU)	<i>Populus angustifolia</i>	FACW
<i>Carex aquatilis</i>	OBL	<i>Poa palustris</i>	FAC
<i>Carex languinosa</i>	OBL	<i>Poa pratensis</i>	FACU+
<i>Carex microptera</i>	FAC	<i>Primula parryi</i>	FAC
<i>Carex nebrascensis</i>	OBL	<i>Prunus virginiana</i>	FACU
<i>Carex utriculata</i>	OBL	<i>Puccinellia distans</i>	OBL
<i>Carex vulpinoides</i>	OBL	<i>Rumex crispus</i>	FAC+
<i>Centaurea maculosa</i>	(FACU)	<i>Salix exigua</i>	OBL
<i>Chenopodium sp.</i>	(UPL)	<i>Scirpus acutus</i>	OBL
<i>Cirsium arvense</i>	FACU+	<i>Scirpus microcarpus</i>	OBL
<i>Crepis runinata</i>	FACU	<i>Scirpus pungens</i>	OBL
<i>Cynoslossum officinale</i>	(UPL)	<i>Scirpus validus</i>	OBL
<i>Dactylis glomerata</i>	FACU	<i>Senecio integerimus</i>	FAC
<i>Deschampsia cespitosa</i>	FACW	<i>Solidago canadensis</i>	FACU
<i>Eleocharis palustris</i>	OBL	<i>Solidago occidentalis</i>	FACW
<i>Elymus canadensis</i>	FAC	<i>Spartina pectinata</i>	OBL
<i>Elymus cinereus</i>	(FACU)	<i>Symphoricarpos albus</i>	FACU
<i>Epilobium ciliatum.</i>	FACW-	<i>Trifolium fragiferum</i>	FACU
<i>Equisetum arvense</i>	FAC	<i>Trifolium hybridum</i>	FACU+
<i>Equisetum hymoides</i>	FACW	<i>Tragopogon dubius</i>	(FACU)
<i>Festuca arundinacea</i>	FACU	<i>Typha latifolia</i>	OBL
<i>Glyceria elata</i>	FACW+	<i>Veronica americana</i>	OBL
<i>Glyceria grandis</i>	OBL	<i>Verbascum thapsus</i>	(UPL)

¹ **Bolded** species indicate those documented within the analysis area for the first time in 2007.

² Species in parenthesis indicate either not included or classified as “non-indicator” in the *National List of Plant Species that Occur in Wetlands: Northwest (Region 9)* (Reed 1988); status in parentheses are probable and based on biologist's experience.

Changes in the vegetation along Big Timber Creek include the transition of the gravel bars to wetlands with *Populus angustifolia* seedlings, loss of upland banks due to channel migration, and improved vegetation cover and diversity in both riparian wetland and uplands in addition to the buffer areas. Young *Populus angustifolia* and *Salix* species seedlings are increasing in size and quantity. As these plants mature, their growth habit will eventually aid in reducing the energy of high water flows.

In 2004, the overall survival of the willow cuttings along Big Timber Creek was estimated between 40 to 45 percent. In 2005, primarily due to overbank flows and bank loss, the overall survival of the willow cuttings was reduced. It was estimated that 25 to 30 percent of the original willow cuttings planted are still in place and alive. In 2006, the majority of the willow cuttings planted in the upper reaches of the reconstructed channel were gone due to high water flows. Cuttings were still present and viable in the lower reaches of the channel. It is estimated that approximately 10 percent of the original willow cuttings planted remain in place and alive. In 2007, the cuttings were present and viable in the lower reaches of the channel. The estimated 10 percent survival has not changed.

In 2004, the estimated survival of transplanted cottonwood seedlings was approximately 60 to 65 percent. The cottonwoods were planted further inland and were not negatively affected by high water flows. Few dead or declining cottonwood seedlings were noted during the 2005, 2006 and 2007 field survey. During the 2007 field survey, cottonwood seedlings were generally robust and healthy with new growth. Details of the plant survival along the stream channel are presented in **Appendix B** (page 6).

Natural recruitment of willows and cottonwoods was noted primarily on the two larger, more stable terraces along the creek. Numerous volunteer cottonwoods were noted on the terrace along the western side of the creek where the transect is located. The large inside curve on the southwestern side of the creek was growing numerous cottonwood root suckers and some young willows. Young willows were also observed on several side bars, also in the lower reaches of the channel.

Three Category I state noxious weed species were present at the site in 2007: hound's-tongue (*Cynoglossum officinale*), Canada thistle (*Cirsium arvense*), and spotted knapweed (*Centaurea maculosa*). Two County listed noxious weed, black henbane (*Hyoscyamus niger*) and musk thistle (*Carduus nutans*) were observed. Areas with weeds were not mapped on the 2007 **Figure 3** as they do not constitute discrete vegetation communities. Canada thistle, hound's-tongue, spotted knapweed, black henbane and musk thistle were observed in the bank areas along Big Timber Creek as small and sporadic infestations. Canada thistle was observed within the off-channel restored/created wetlands and the disturbed uplands as small and sporadic infestations. Canada thistle and hound's-tongue in upland or transition areas had been sprayed in 2006 and 2007. Because Canada thistle, hound's-tongue, spotted knapweed, black henbane, and musk thistle are present, there is potential for these weeds to increase in numbers and out-compete native plants desired by wildlife. Canada thistle, in particular, can colonize very moist areas.

Table 2a: 2004 to 2007 Transect 1 data summary.

Monitoring Year	2004	2005	2006	2007
Transect Length (feet)	195	195	195	195
# Vegetation Community Transitions along Transect	3	3	3	3
# Vegetation Communities along Transect	3	3	2	3
# Hydrophytic Vegetation Communities along Transect	1	2	1	2
Total Vegetative Species	19	18	15	12
Total Hydrophytic Species	11	8	7	6
Total Upland Species	9	10	8	6
Estimated % Total Vegetative Cover	60	71	73	67
% Transect Length Comprised of Hydrophytic Vegetation Communities	25	23	41	78
% Transect Length Comprised of Upland Vegetation Communities	40	36	15	12
% Transect Length Comprised of Unvegetated Open Water	25	15	8	8
% Transect Length Comprised of Bare Substrate	10	26	36	2

Chart 1: Length of vegetation communities along Transect 1.

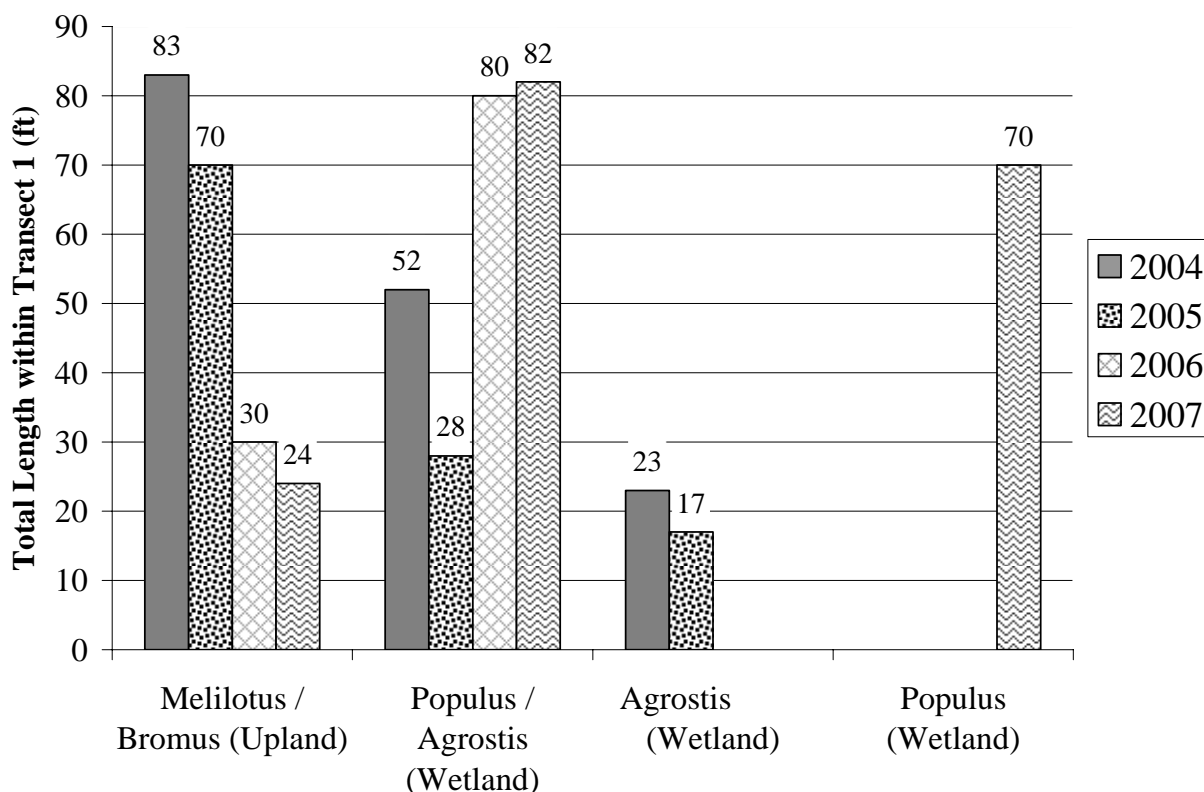
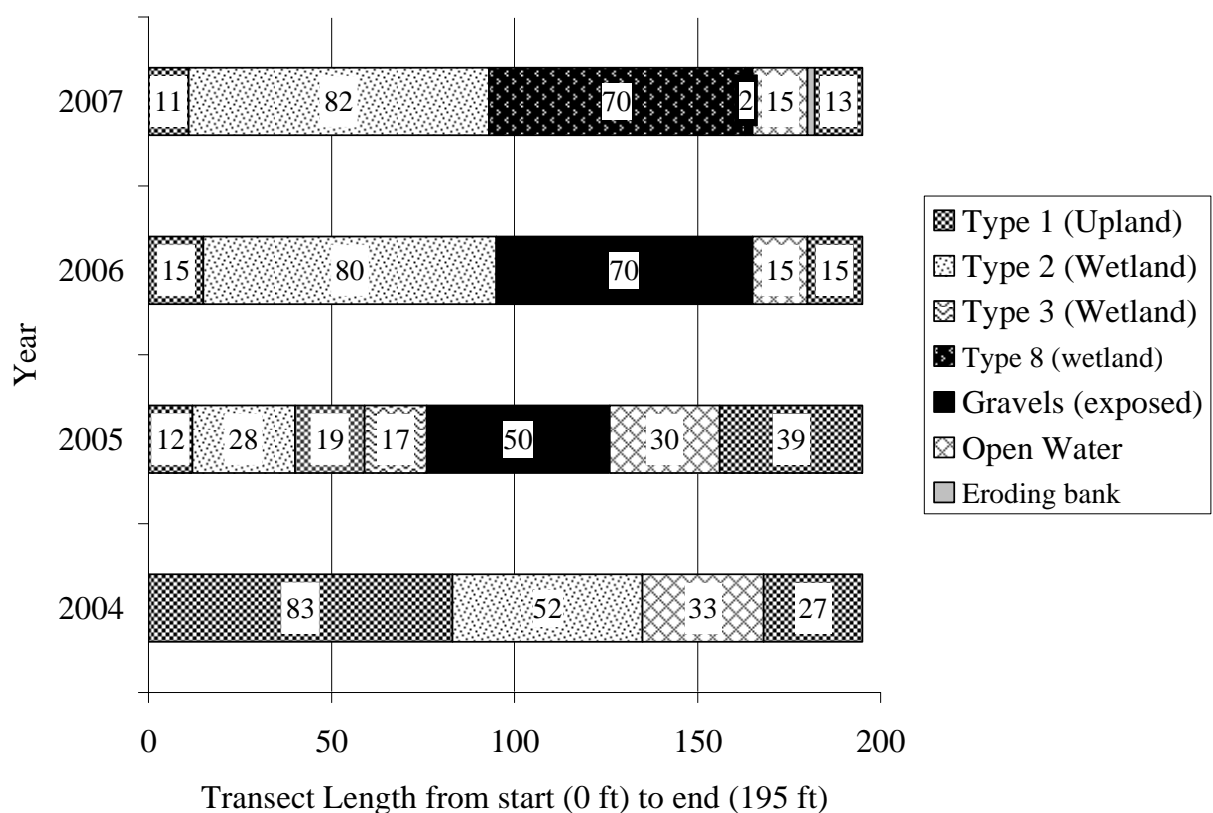


Chart 2: Transect map showing vegetation types of Transect 1 from start (0 feet) to end (195 feet) from 2004 to 2007.**Table 2b: 2004 to 2007 Transect 2 data summary.**

Monitoring Year	2004	2005	2006	2007
Transect Length (feet)	200	200	200	200
# Vegetation Community Transitions along Transect	2	2	2	2
# Vegetation Communities along Transect	3	2	2	2
# Hydrophytic Vegetation Communities along Transect	1	1	1	1
Total Vegetative Species	12	15	19	23
Total Hydrophytic Species	7	10	9	14
Total Upland Species	3	5	10	9
Estimated % Total Vegetative Cover	60	70	83	87
% Transect Length Comprised of Hydrophytic Vegetation Communities	54	90	93	93.5
% Transect Length Comprised of Upland Vegetation Communities	21	8	6.5	6.5
% Transect Length Comprised of Unvegetated Open Water	0	2	0	0
% Transect Length Comprised of Bare Substrate	25	2	.5	0

Chart 3: Length of vegetation communities along Transect 2.

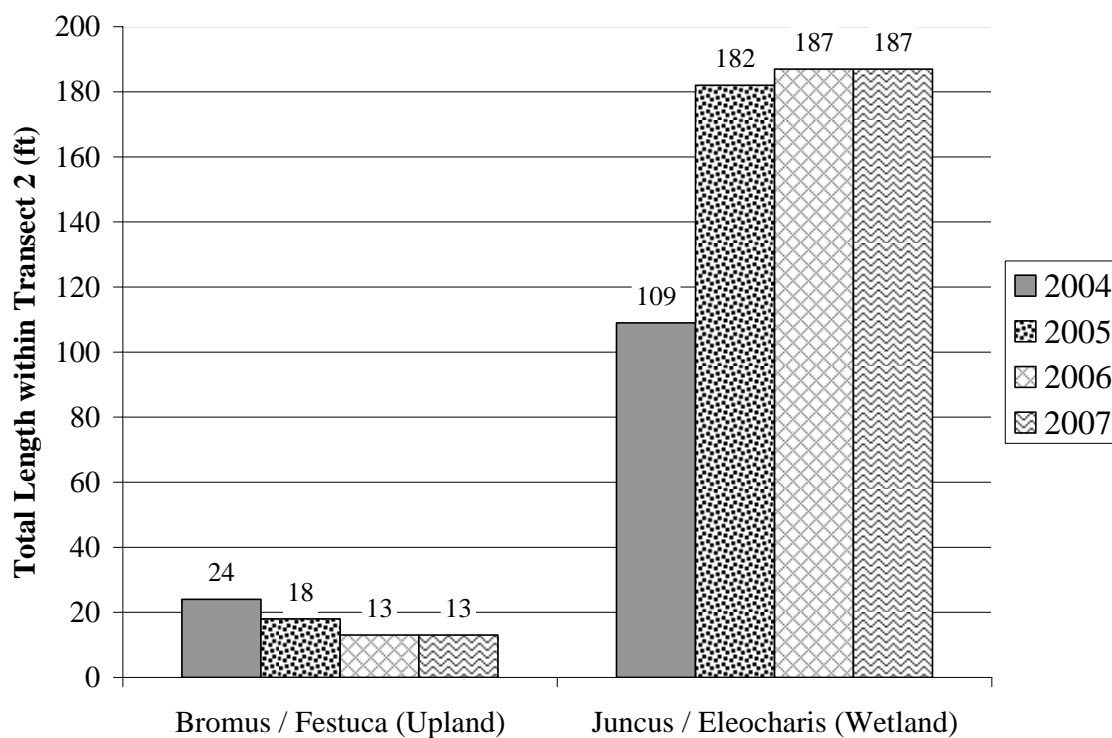
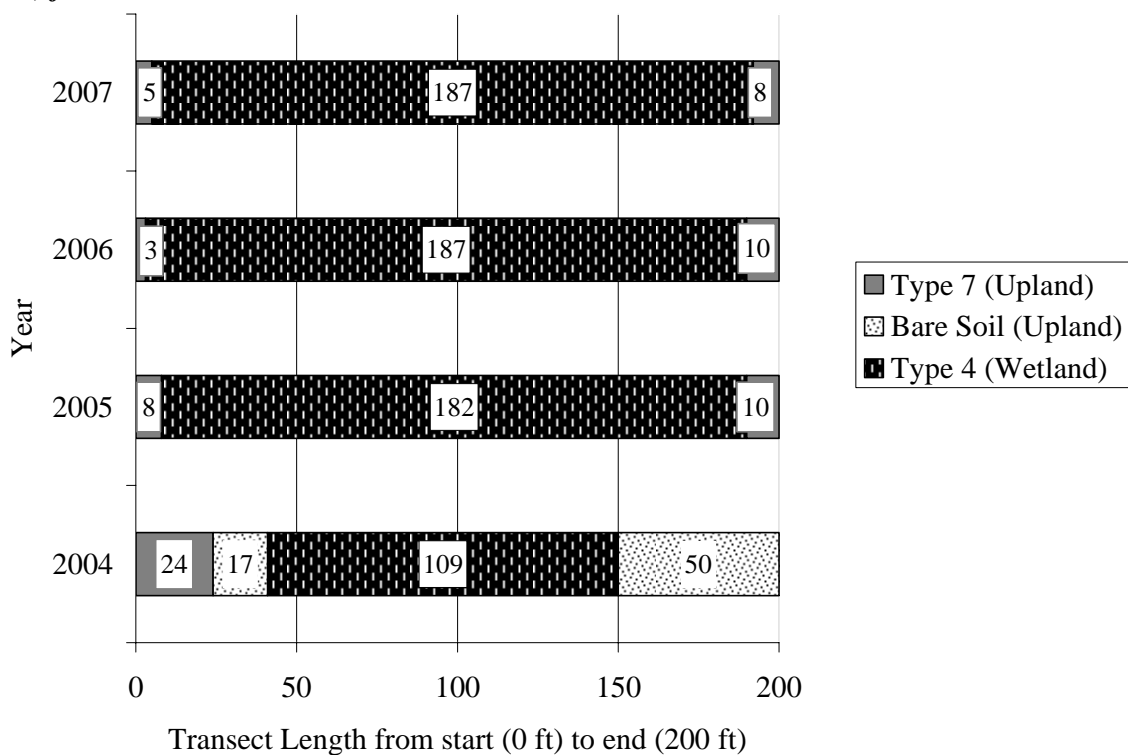


Chart 4: Transect map showing vegetation types of Transect 2 from start (0 feet) to end (200 feet) from 2004 to 2007.



3.3 Soils

The project site was mapped as part of the Sweetgrass County Soil Survey (USDA 1981). The dominant soil on the site is mapped as Nesda-Mcilwaine loam (107A). These soils are found on low stream terraces and flood plains. The Mesda-Mcilwaine soils are both well drained, non hydric soils with approximately 12 inches of loam over extremely gravelly coarse sand. The soil classification is a Fluventic Haploboroll. There are two small inclusions of Albicallis (5%) and Meadowcreek (5%). Albicallis is a loamy textured, hydric soil that is poorly drained. Meadowcreek is not listed as a hydric soil.

Soils were sampled at four sample points (SP-1, SP-2 Transect 1 and SP-3, SP-4 Transect 2). Soil pits 1 and 4 are within a wetland, soil pits 2 and 3 are an upland soil. Soils at SP-1 (Transect 1) were not hydric soils due to the high percent of gravels and cobbles in the soil profile. This sampling area is located near the edge of the creek channel, hydrophytic vegetation and wetland hydrology parameters were present. Hydric soils will be slower to develop. The soils at SP-4 (Transect 2) were a very dark gray (10YR 3/2) clay loam from 0-12 inches with yellowish brown (10YR 5/6) mottles. Soils were saturated at 6 inches.

Soil pits sampled within the upland areas (SP-2 and SP-3) revealed soils with similar textures (silty loam to sandy clay loam). Hydric soils were observed in SP-2 (low chroma values and mottles below 6 inches); however, vegetation and hydrology do not meet the wetland criteria. Soil at SP-3, with a chroma value of 10YR 5/2 (without mottles), was not considered hydric.

3.4 Wetland Delineation

The delineated wetland boundary is depicted on **Figure 3** in **Appendix A**. The COE Forms are included in **Appendix B**. Riverine wetlands generally include low areas or portions of vegetated point or side bars. The vegetation within the off-channel wetlands consisted primarily of emergent vegetation, generally within topographically low areas where saturation has occurred and is developing into wetland areas. Aquatic vegetation such as cattails and bulrush were more common along the perimeter of the spring creek channel and as wide bands south of large open water pond. A total of 2.93 acres of wetlands and open water were delineated in the off-channel wetland development area within the defined monitoring area. This included 0.24 acre of shallow (< 4 feet deep) open water and 0.72 acre of pre-existing wetlands. Approximately 1.1 acre of wetlands were delineated along Big Timber Creek (the Big Timber Creek open water channel is not included in this total).

Subtracting the pre-existing wetlands from the total yields a net gain of 3.31 aquatic habitat acres (1.97 wetland acres off-channel, 0.24 shallow open water acres off-channel, and 1.1 wetland acres along Big Timber Creek) at the monitoring sites.

3.5 Wildlife

Wildlife species observed on the site in 2007 are listed in **Table 3**. Activities and densities associated with these observations are included on the Monitoring Form in **Appendix B**.

Table 3: 2004 to 2007 fish and wildlife species observed within the Cloud Ranch Wetland Mitigation Site.

REPTILES	
Western terrestrial garter snake (<i>Thamnophis elegans</i>)	
AMPHIBIANS	
Western Chorus Frog (<i>Pseudacris triseriata</i>) ¹	
FISH	
Brook trout (<i>Salvelinus fontinalis</i>) ¹	
Brown trout (<i>Salmo trutta</i>) ¹	
Rainbow trout (<i>Oncorhynchus mykiss</i>) ¹	
BIRDS	
American Goldfinch (<i>Carduelis psaltria</i>)	Least Flycatcher (<i>Empidonax minimus</i>)
American Robin (<i>Turdus migratorius</i>)	Red-naped Sap sucker (<i>Sphyrapicus nuchalis</i>)
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	Red-winged Blackbird (<i>Agelaius phoeniceus</i>)
Belted Kingfisher (<i>Ceryle alcyon</i>)	Song Sparrow (<i>Melospiza melodia</i>)
Bullock's Oriole (<i>Icterus bullockii</i>)	Spotted Sandpiper (<i>Actitis macularia</i>)
Common Nighthawk (<i>Chordeiles minor</i>)	Warbling Vireo (<i>Vireo gilvus</i>)
Common Yellowthroat (<i>Geothlypis trichas</i>)	Western Wood Pewee (<i>Contopus sordidulus</i>)
European Starling (<i>Sturnus vulgaris</i>)	Unidentified sparrow sp.
Gray Catbird (<i>Dumetella carolinensis</i>)	Yellow Warbler (<i>Dendroica petechia</i>)
House Wren (<i>Troglodytes aedon</i>)	Yellow-rumped Warbler (<i>Dendroica coronata</i>)
MAMMALS	
Black bear (<i>Ursus americanus</i>) ¹	
White-tailed deer (<i>Odocoileus virginianus</i>)	
Mule deer (<i>Odocoileus hemionus</i>) ¹	
Raccoon (<i>Procyon lotor</i>)	

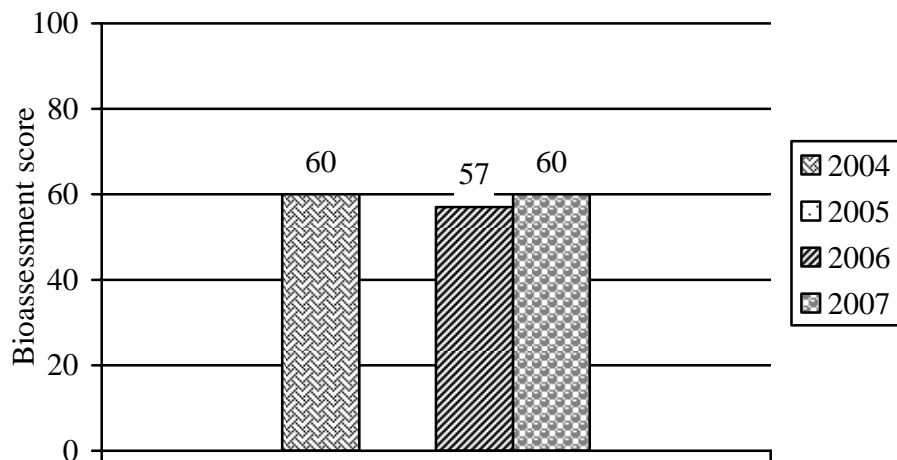
¹ Observed by Aquatic Design & Construction, Inc.**Bolded** species indicate those documented within the analysis area in 2007.

3.6 Macroinvertebrates

Macroinvertebrate sampling results are provided in **Appendix F** and were summarized by Rhithron Associates in the italicized section below (Bollman 2007).

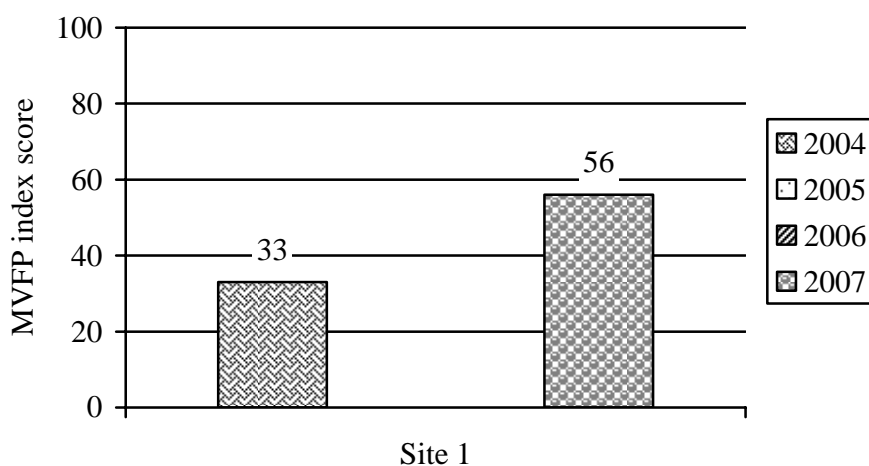
Cloud Ranch off-channel wetlands: Sub-optimal conditions were indicated by the bioassessment scores calculated for this site in all 3 years. A loss of crustacean taxa was apparent between 2006 and 2007; midges overwhelm the fauna in 2007. This suggests that benthic substrates are the dominant habitat type. Vegetation may be sparse. Invertebrate diversity has been low in all years. A single specimen of an early-instar stonefly was present in the sample; this anomalous finding suggests the influence of nearby flowing water habitats.

Chart 5: 2004 to 2007 Cloud Ranch off-channel wetland bioassessment scores.



Cloud Ranch stream: The invertebrate fauna at this site was dominated by rheophilic taxa; the MVFP (lotic) index was used to assess biotic integrity here. Invertebrate abundance and diversity were both low, compared to expectations for a stream site. Mayflies were poorly represented; water quality may have been somewhat degraded by nutrient enrichment and/or organic pollution. Fine sediment deposition may have limited colonization of stony substrates. The thermal preference of the invertebrate assemblage is estimated to be 15.0°C. Slight impairment is indicated.

Chart 6: 2004 to 2007 Cloud Ranch stream bioassessment scores.



3.7 Functional Assessment

Completed Functional Assessment Forms are included in **Appendix B** and summarized in **Table 4**. Pre-construction functional assessments were completed for the wetlands by ADC (2003) but

have thus far not been received for use in monitoring reports. The creek corridor wetlands currently rate as a Category II community, primarily due to wildlife habitat, while the off-channel wetlands were assigned a Category III rating. The ratings have been consistent over the monitoring period to date, although in 2007 ratings for threatened and endangered species habitat decreased due to the de-listing of the Bald Eagle, which could no longer be considered under this parameter. An erroneous rating for surface water storage in 2004 and 2005 at both sites resulted in incorrect Category II designations for the off-channel wetlands in those years, which was corrected for 2004-2007 as shown on **Table 4**.

3.8 Photographs

Representative photos taken from photo points and transect ends are included in **Appendix C**.

3.9 Maintenance Needs/Recommendations

The site supports three State of Montana-listed noxious weeds: Canada thistle, hound's-tongue, and spotted knapweed as well as two County listed noxious weeds; black henbane and musk thistle. Canada thistle, hound's-tongue, black henbane, musk thistle and a few spotted knapweed plants were observed along Big Timber Creek. Canada thistle and hound's-tongue were observed within the off-channel wetland assessment area. As mentioned earlier, the spotted knapweed, hound's-tongue and Canada thistle appeared to have been sprayed in 2006 and 2007 in the upland areas adjacent to the off-channel wetlands. Continued chemical or biological control measures are recommended for Canada thistle, hound's-tongue, spotted knapweed, musk thistle and black henbane.

Table 4: Summary of 2004 to 2007 wetland function/value ratings and functional points at the Cloud Ranch Wetland Mitigation Project.

Function and Value Parameters From the 1999 MDT Montana Wetland Assessment Method	2004 Post-Construction Off-Channel Wetlands	2004 Post-Construction Big Timber Creek	2005 Off-Channel Wetlands	2005 Big Timber Creek	2006 Off-Channel Wetlands	2006 Big Timber Creek	2007 Off-Channel Wetlands	2007 Big Timber Creek
Listed/Proposed T&E Species Habitat	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.0)	Low (0.0)
MNHP Species Habitat	Low (0.1)	Mod (0.6)	Low (0.1)	Mod (0.6)	Low (0.1)	Mod (0.6)	Low (0.1)	Mod (0.6)
General Wildlife Habitat	Mod (0.7)	High (0.9)	Mod (0.7)	High (0.9)	Mod (0.7)	High (0.9)	Mod (0.7)	High (0.9)
General Fish/Aquatic Habitat	NA	Mod (0.7)	NA	Mod (0.7)	NA	Mod (0.7)	NA	Mod (0.7)
Flood Attenuation	Mod (0.5)	Mod (0.4)	Mod (0.5)	Mod (0.4)	Mod (0.5)	Mod (0.4)	Mod (0.5)	Mod (0.4)
Short and Long Term Surface Water Storage	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)
Sediment, Nutrient, Toxicant Removal	High (1.0)	Mod (0.6)	High (1.0)	Mod (0.6)	High (1.0)	Mod (0.6)	High (1.0)	High (0.9)
Sediment/Shoreline Stabilization	High (1.0)	Mod (0.7)	High (1.0)	Mod (0.7)	High (1.0)	Mod (0.7)	High (1.0)	Mod (0.7)
Production Export/Food Chain Support	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	High (0.8)
Groundwater Discharge/Recharge	High (1.0)	High (1.0)	High (1.0)	High (1.0)	High (1.0)	High (1.0)	High (1.0)	High (1.0)
Uniqueness	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)
Recreation/Education Potential	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)
Actual Points/Possible Points	7/11	7.6/12	7/11	7.6/12	7/11	7.6/12	6.7/11	7.7/12
% of Possible Score Achieved	64%	63%	64%	63%	64%	63%	61%	64%
Overall Category	III	II	III	II	III	II	III	II
Total Acreage of Assessed Wetlands and Open Water within Easement (ac)	2.19	2.65	2.75	2.93	2.93	2.88	2.93	3.27
Baseline Acreage of Assessed Wetlands and Open Water within Easement (ac)	0.72	2.17 (ow)	0.72	2.17 (ow)	0.72	2.17 (ow)	0.72	2.17 (ow)
Functional Units (acreage x actual points) (fu)	15.33	20.14	19.25	22.27	20.51	21.89	19.63	25.18
Net Acreage Gain (ac)	1.47 (1.2 wetland, 0.27 ow)	0.48 (wetland)	2.03 (1.79 wetland, 0.24 ow)	0.76 (wetland)	2.21 (1.97 wetland, 0.24 ow)	0.71 (wetland)	2.21 (1.97 wetland, 0.24 ow)	1.1 (wetland)
Net Functional Unit Gain ¹	Presently unavailable	Presently unavailable	3.92 (since 2004)	2.13 (since 2004)	5.18 (since 2004)	1.75 (since 2004)	4.3 (since 2004)	5.04 (since 2004)
Total Functional Unit Gain ¹	Presently unavailable		6.05 (since 2004)		6.93 (since 2004)		9.34 (since 2004)	

¹ Baseline functional assessment information was unavailable as of the writing of this report.

The water level control structures within the off-channel wetlands were functioning and in good working order at the time of the July monitoring. Big Timber Creek channel migration resulted in minor bank loss in 2007. Gravel bars and new deposition areas will continue to be monitored to track riparian wetland gains or losses, development of the cottonwood communities and/or negative or undesirable changes in vegetation. As mentioned earlier, the project designer commented in 2006 that the upper end of the lowest reach is likely to continue shifting before it stabilizes and some minor intervention in this area may eventually be warranted. If ultimately considered necessary by the designer, landowner, and MDT, any such intervention should be completed within the monitoring period.

3.10 Current Credit Summary

MDT anticipated creation and restoration of this site to provide 5.5 acres of credit within a 15.5 acre conservation easement. A summary table from the COE of potential wetland credits is provided in **Appendix G** (COE 2002 letter). The COE allows a 1:1 ratio for creation and restoration for Big Timber Creek and the off-channel wetlands as well as a 4:1 ratio for a buffer zone. **Table 5** outlines the target wetland credits and ratios from the COE (2002) and the net acres delineated during the 2007 wetland monitoring.

In 2007, the net off-channel wetland/open water acreage is 2.21 acres (2.69 acres total wetland +0.24 acre open water – 0.72 acre of pre-existing wetlands = 2.21 acres). The Big Timber Creek wetland acreage is 1.1 acre; an increase of 0.39 acre compared to 2006 due to the population of young cottonwood seedlings along the upper reach of the creek. Riparian wetlands comprise 0.92 acre along Big Timber Creek with 0.18 acre of emergent wetlands. The Big Timber Creek channel itself is not included in acreage totals.

As of 2007, the mitigation efforts have resulted in a total of 3.07 wetland credit acres, 0.24 shallow open water credit acres, and 0.89 credit acre of wetland/upland buffer. The grand total for the Cloud Ranch to date is 4.2 credit acres or 76 percent of the 5.49-acre goal.

It may be difficult to attain the remaining 1.48-acre wetland development goal along the creek in the short term. The migration of the stream in 2006 created a new channel by cutting through a small point bar wetland. The abandoned channel is a broad dry rock meander and represents a fairly large sparsely or barren area within the project. This area may take considerable amount of time to establish wetland vegetation along the higher terraces. The lower area will likely continue to serve as a overflow channel or oxbow.

Table 5. 2007 credit acreages and ratios for the Cloud Ranch Wetland Mitigation Site.

Wetland Mitigation	Current Net Acres	Ratio	2007 Credit Acres	Target Credit Acres	Comments
Off-channel ¹ Creation and restoration wetlands and open water	2.21	1:1	2.21	2.02	
Subtotal	2.21		2.21	2.02	
Big Timber Creek ² Riparian wetland restoration	0.92	1:1	0.92	2.00	Riparian wetland community represented by Type 2.
Emergent wetland restoration	0.18	1:1	0.18	0.58	Emergent wetland restoration represented by Type 3.
Subtotal	1.10		1.1	2.58	
Upland and Wetland Buffer	3.56	4:1	0.89	0.89	Credited only if livestock grazing is prohibited on wetland sites.
Subtotal	3.56		0.89	0.89	
GRAND TOTAL	6.87		4.20	5.49	76% of goal

¹. This acreage correlates to lines 2 and 3 in the October 2, 2002 COE table Appendix G.

². This acreage correlates to lines 4, 5 and 6 respectively in the Oct 7, 2002 COE table Appendix G.

4.0 REFERENCES

- Berglund, J. 1999. *MDT Montana Wetland Assessment Method*. Prepared for Montana Department of Transportation. May 1999.
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- Reed, P.B. 1988. National list of plant species that occur in wetlands: North West (Region 9). Biological Report 88(26.9), May 1988. U.S. Fish and Wildlife Service. Washington, D.C.
- USDA Natural Resource Conservation Service. 1981. *Soil Survey of Sweetgrass County, Montana*.
- USGS Real Time Water Data for USGS 0620000 Boulder River at Big Timber MT. 2007. http://waterdata.usgs.gov/mt/nwis/dv?site_no=0620000&agency_cd=USGS&referred.
- Western Regional Climate Center (WRCC). 2007. Big Timber Station: <http://www.wrcc.dri.edu/cgi-bin/cliMONTpre.pl?mtbigt>.

Appendix A

FIGURES 2 & 3

*MDT Wetland Mitigation Monitoring
Cloud Ranch
Big Timber, Montana*

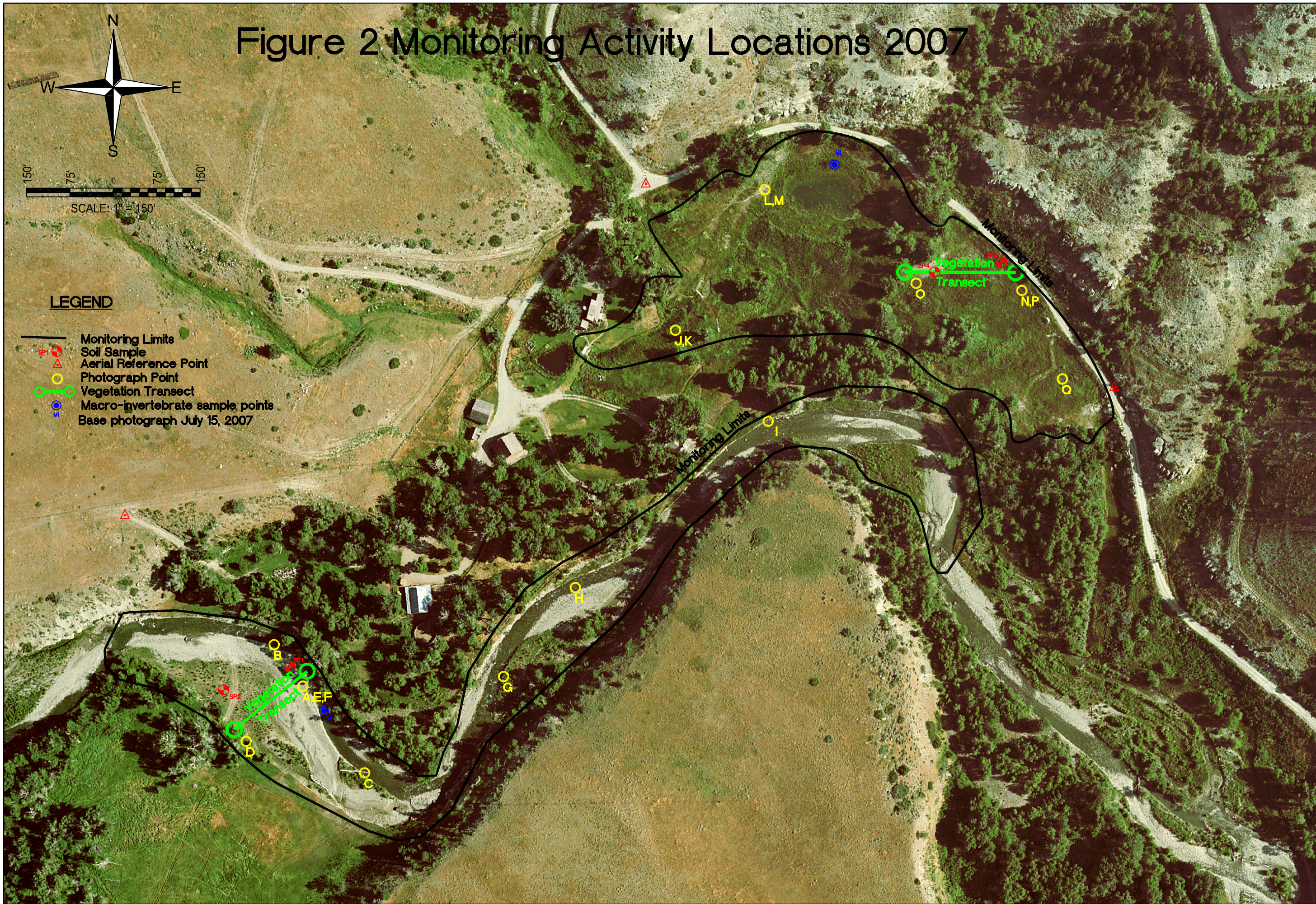
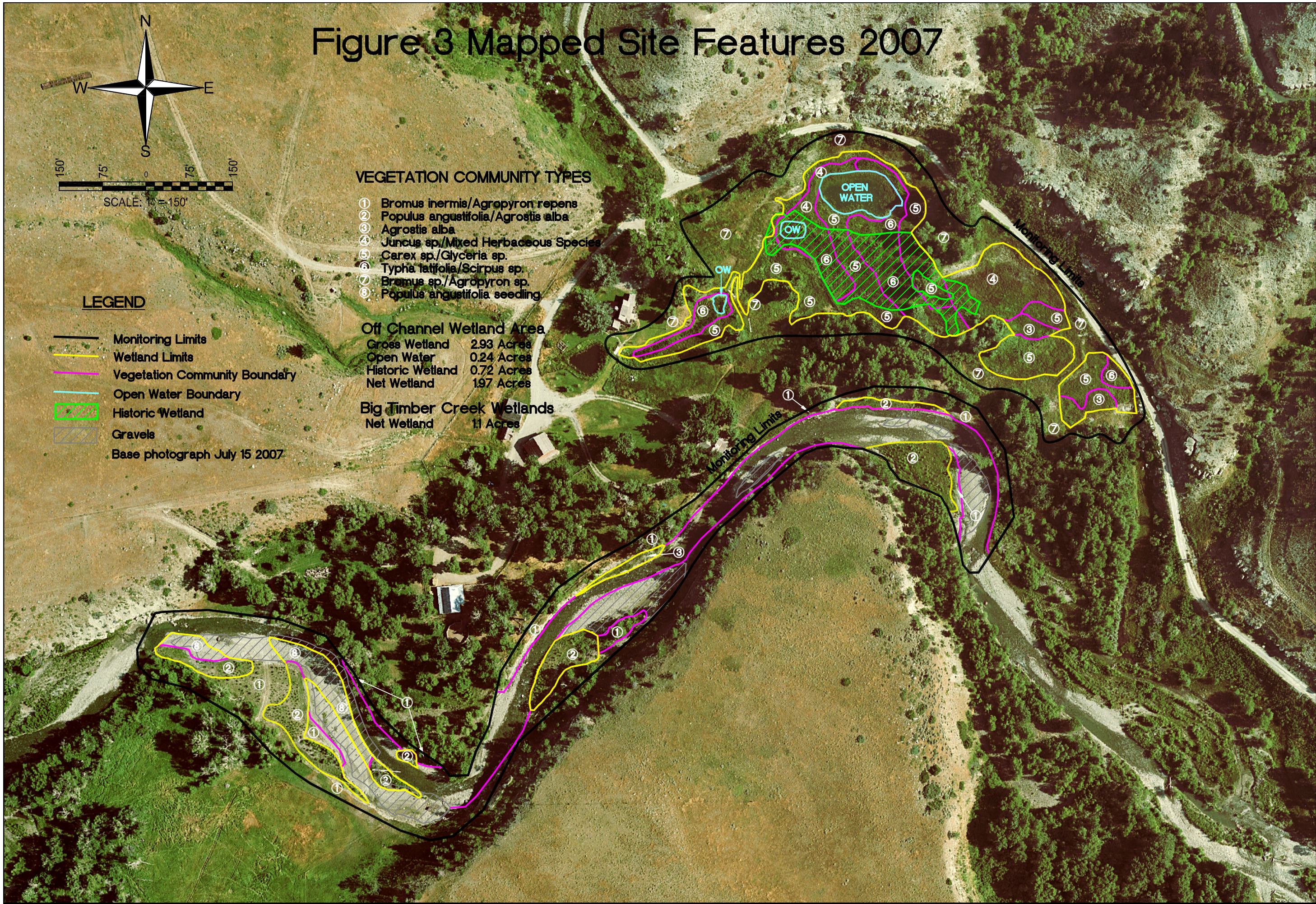


Figure 2 Monitoring Activity Locations 2007

	PROJECT NAME MDT CLOUD RANCH WETLAND MITIGATION	
	DRAWING TITLE MONITORING ACTIVITY LOCATIONS 2007	
	PROJ NO: B43088.00 0502 LOCATION: BIG TIMBER, MT SCALE: 1" = 150' FILE NAME: 2007 Base.dwg	DRAWN: SH/JR PROJ MGR: J. BERGLUND CHECKED: CH APPVD: JB
	FIGURE 2 OF REV - Nov/08/2007	

Figure 3 Mapped Site Features 2007



Appendix B

2007 WETLAND MITIGATION SITE MONITORING FORM

2007 BIRD SURVEY FORMS

2007 COE WETLAND DELINEATION FORMS

2007 FUNCTIONAL ASSESSMENT FORMS

MDT Wetland Mitigation Monitoring

Cloud Ranch

Big Timber, Montana

LWC / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: Cloud Ranch Project Number: B43088-0502
Assessment Date: July 24, 2007 Person(s) conducting the assessment: CH
Location: 12 miles north of Big Timber MDT District: Billings Milepost: _____
Legal Description: T 3N R 13E Section 36
Weather Conditions: partly cloudy/warm Time of Day: 11 AM
Initial Evaluation Date: August 23, 2004 Monitoring Year: fourth # Visits in Year: 1
Size of evaluation area: 5.5 acres Land use surrounding wetland: pasture/rangeland/residential

HYDROLOGY

Surface Water Source: Big Timber Creek and an unnamed spring creek
Inundation: Present Average Depth: 0.5 Range of Depths: 1 to 2 inches
Percent of assessment area under inundation: 30%
Depth at emergent vegetation-open water boundary: 0.5 feet
If assessment area is not inundated then are the soils saturated within 12 inches of surface: Yes
Other evidence of hydrology on the site (ex. – drift lines, erosion, stained vegetation, etc.):
Cottonwood seedlings, water marks, drift lines and surface water

Groundwater Monitoring Wells: Absent

Record depth of water below ground surface (in feet):

Well Number	Depth	Well Number	Depth	Well Number	Depth

Additional Activities Checklist:

- ☒ Map emergent vegetation-open water boundary on aerial photograph.
- ☒ Observe extent of surface water during each site visit and look for evidence of past surface water elevations (drift lines, erosion, vegetation staining, etc.)
- ☐ Use GPS to survey groundwater monitoring well locations, if present.

COMMENTS / PROBLEMS:

Surface water was observed in approximately 30 percent of the off-channel assessment area during the July monitoring trip. The unnamed tributary supplying water to the off-channel wetlands approximately 4 to 5 inches below bankfull.

VEGETATION COMMUNITIES

Community Number: **1** Community Title (main spp): **Bromus inermis/Agropyron repens**

Dominant Species	% Cover	Dominant Species	% Cover
Bromus inermis	3 = 11-20%	Deschampsia cespitosa	1 = 1-5%
Agropyron repens	3 = 11-20%	Helianthus annuus	1 = 1-5%
Populus angustifolia	2 = 6-10%	Melilotus officinalis	1 = 1-5%
Phleum pratense	1 = 1-5%	Agropyron riparium	1 = 1-5%
Equisetum hymoides	1 = 1-5%	Bromus marginatus	1 = 1-5%
Agrostis alba	1 = 1-5%	Cobbles/bare soil	1 = 1-5%
Solidago canadensis	1 = 1-5%	Litter	2 = 6-10%

Comments / Problems: **A few Cirsium arvense, Cynoglossum officinale, and Arctium minus were noticed in this community type.**

Community Number: **2** Community Title (main spp): **Populus angustifolia/Agrostis alba**

Dominant Species	% Cover	Dominant Species	% Cover
Populus angustifolia-2 to 5 ft tall	4 = 21-50%	Bromus ciliatus	1 = 1-5%
Agrostis alba	3 = 11-20%	Elymus canadensis	1 = 1-5%
Deschampsia cespitosa	2 = 6-10%	Cirsium arvense	1 = 1-5%
Poa palustris	1 = 1-5%	Carex microptera	1 = 1-5%
Equisetum hymoides	1 = 1-5%	Alopecurus pratensis	1 = 1-5%
Juncus tenuis	1 = 1-5%	Cobbles/rock	3 = 11-20%
Salix exigua (seedlings)	1 = 1-5%	Litter	2 = 6-10%

Comments / Problems: **Riverine wetland vegetation is dependent upon creek flows and periodic flooding. Weather (precipitation and flow events) influence the percent cover, species diversity and rate of wetland development along the creek. In 2007, there was a significant increase in the height and cover of Populus angustifolia. CT2 is continuing to develop and mature along this reach of Big Timber creek. No signs of wetland loss were noted in 2007 due to high flows.**

Community Number: **3** Community Title (main spp): **Agrostis alba**

Dominant Species	% Cover	Dominant Species	% Cover
Agrostis alba	4 = 21-50%	Phalaris arundinacea	1 = 1-5%
Salix exigua	2 = 6-10%	Poa palustris	1 = 1-5%
Alopecurus pratensis	1 = 1-5%	Epibolium ciliatum	1 = 1-5%
Deschampsia cespitosa	1 = 1-5%	Elymus canadensis	1 = 1-5%
Juncus torreyi	1 = 1-5%	Mentha arvensis	+ = < 1%
Glyceria elata	1 = 1-5%	Rocks/cobbles/gravels	2 = 6-10%

Comments / Problems: **This community lacks the woody component noted in CT 2, but in 2007 starting to see an increase in Salix exigua seedlings.**

VEGETATION COMMUNITIES (continued)

Community Number: **4** Community Title (main spp): **Juncus sp./Mixed Herbaceous Species**

Dominant Species	% Cover	Dominant Species	% Cover
Juncus torreyi	2 = 6-10%	Carex nebrascensis	2 = 6-10%
Juncus mertensianus	1 = 1-5%	Carex aquatilis	1 = 1-5%
Juncus longistylis	1 = 1-5%	Scirpus validus	1 = 1-5%
Juncus ensifolius	1 = 1-5%	Glyceria sp.	1 = 1-5%
Typha latifolia	2 = 6-10%	Eleocharis palustris	1 = 1-5%
Agrostis alba	2 = 6-10%	Mentha arvensis	1 = 1-5%
Carex utriculata	2 = 6-10%		

Comments / Problems: Soils were dry on the surface. Juncus species represented the majority of the cover in this community type but Carex, Typha and Agrostis alba are increasing in abundance. Eleocharis palustris was a co-dominant in 2005 but because there is less open soil and greater canopy cover, the Eleocharis is decreasing in abundance and is being replaced by Juncus and Carex sp.

Community Number: **5** Community Title (main spp): **Carex sp./Glyceria sp.**

Dominant Species	% Cover	Dominant Species	% Cover
Carex utriculata	3 = 11-20%	Deschampsia cespitosa	1 = 1-5%
Glyceria grandis	3 = 11-20%	Juncus torreyi	1 = 1-5%
Carex aquatilis	3 = 11-20%	Juncus mertensianus	1 = 1-5%
Glyceria elata	1 = 1-5%	Juncus balticus	1 = 1-5%
Carex languinosa	1 = 1-5%	Scirpus pungens	1 = 1-5%
Agrostis alba	2 = 6-10%	Calamagrostis canadensis	1 = 1-5%
Typha latifolia	1 = 1-5%	Carex nebrascensis	1 = 1-5%

Comments / Problems: This community typically forms a distinct community adjacent to the Typha latifolia/Scirpus community. Glyceria is the co-dominant in areas with surface or flowing water. In 2007 with the reduction of surface water there is decrease in the abundance of Glyceria. This community type continues to be diverse with a variety of species.

Community Number: **6** Community Title (main spp): **Typha latifolia/Scirpus sp.**

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	4 = 21-50%	Beckmannia syzigachne	+ = < 1%
Scirpus validus	2 = 6-10%	Glyceria grandis	1 = 1-5%
Scirpus microcarpus	1 = 1-5%	Mentha arvensis	+ = < 1%
Scirpus acutus	2 = 6-10%	Carex vulpinoidea	1 = 1-5%
Carex utriculata	1 = 1-5%	Scirpus pungens	1 = 1-5%
Carex aquatilis	1 = 1-5%	Salix exigua	2 = 6-10%

Comments / Problems: This community type was found along the unnamed spring creek channel or in areas where surface water persisted through most of the summer. There is an increase in the abundance and cover of Salix exigua along the edges of this community type.

VEGETATION COMMUNITIES (continued)

Community Number: **7** Community Title (main spp): **Bromus sp./Agropyron sp.**

Dominant Species	% Cover	Dominant Species	% Cover
Bromus inermis	4=21-50%	Dactylis glomerata	2 = 6-10%
Bromus marginatus	1 = 1-5%	Populus angustifolia*	2 = 6-10%
Agropyron riparium	2 = 6-10%	Agrostia alba	1 = 1-5%
Agropyron repens	2 = 6-10%	Cirsium arvensis	1 = 1-5%
Agropyron trachycaulum	2 = 6-10%	Festuca arundinacea	1 = 1-5%
Phleum pratensis	1 = 1-5%		
Elymus canadensis	1 = 1-5%		

Comments / Problems: ***Populus angustifolia represents scattered mature trees within this community type. This community type represents the buffer area around the off-channel wetlands. In 2007, young Populus angustifolia seedlings/root suckers (12 to 24 inches tall) were noticed in the buffer area.**

Community Number: **8** Community Title (main spp): **Populus angustifolia (<12 inches tall).**

Dominant Species	% Cover	Dominant Species	% Cover
Populus angustifolia	5 = >50%		
Agrostis alba, Poa palustris	2= 6-10%		
Lupine sp., Melilotus officinalis	1 = 1-5%		

Comments / Problems: **The migration of Big Timber creek in 2006 created new, unvegetated exposed gravel bars within the project area. This year, 3 to 4 inch Populus angustifolia seedlings were abundant on approximately 50% of the gravel bars along Big Timber creek. Weed species were observed in drier transition areas and included Verbascum thapsus, Hyoscyamus niger, Linaria vulgaris, and Carduus nutans.**

Additional Activities Checklist: ☒ Record and map vegetative communities on aerial photograph.

COMPREHENSIVE VEGETATION LIST

Plant Species	Vegetation Community Number (s)	Plant Species	Vegetation Community Number (s)
<i>Achillea millefolium</i>	1	<i>Helianthus annuus</i>	1
<i>Agropyron repens</i>	1, 7	<i>Hordeum jubatum</i>	3, 4, 7
<i>Agropyron riparium</i>	1, 7	<i>Hyoscyamus niger</i>	7, 8
<i>Agropyron smithii</i>	7	<i>Juncus balticus</i>	5
<i>Agropyron trachycaulum</i>	7	<i>Juncus ensifolius</i>	2, 4, 5
<i>Agrostis alba</i>	1, 2, 3, 4, 5, 7, 8	<i>Juncus longistylis</i>	4
<i>Alopecurus aequalis</i>	4	<i>Juncus mertensianus</i>	4, 5
<i>Alopecurus arundinaceus</i>	3	<i>Juncus tenuis</i>	2, 5
<i>Alopecurus pratensis</i>	2, 3	<i>Juncus torreyi</i>	2, 3, 4, 5
<i>Ambrosia trifida</i>	1	<i>Linaria vulgaris</i>	8
<i>Arctium minus</i>	1, 2	<i>Lupine sp.</i>	8
<i>Beckmannia syzigachne</i>	3, 4, 6,	<i>Melilotus officinalis</i>	1,8
<i>Betula occidentalis</i>	1	<i>Mentha arvensis</i>	2, 3, 4, 6
<i>Bromus ciliatus</i>	2	<i>Mimulus guttatus</i>	2
<i>Bromus inermis</i>	1, 7	<i>Phalaris arundinacea</i>	3
<i>Bromus marginatus</i>	1, 7	<i>Phleum pratense</i>	1, 7
<i>Bromus japonicus</i>	7	<i>Populus angustifolia</i>	1, 2, 3, 7, 8
<i>Calamagrostis canadensis</i>	5	<i>Poa palustris</i>	2, 3, 4, 5, 8
<i>Carduus nutans</i>	8	<i>Poa pratensis</i>	1, 7
<i>Carex aquatilis</i>	4, 5, 6	<i>Primula parryi</i>	8
<i>Carex languinosa</i>	5, 6	<i>Prunus virginiana</i>	7
<i>Carex microptera</i>	2	<i>Puccinellia distans</i>	2
<i>Carex nebrascensis</i>	4, 5	<i>Rumex crispus</i>	2
<i>Carex utriculata</i>	4, 5, 6	<i>Salix exigua</i>	2, 3, 6
<i>Carex vulpinoides</i>	6	<i>Senecio integerrimus</i>	2
<i>Centaurea maculosa</i>	1	<i>Scirpus acutus</i>	4, 6
<i>Chenopodium sp.</i>	1	<i>Scirpus microcarpus</i>	6
<i>Cirsium arvense</i>	1, 2, 7, 8	<i>Scirpus validus</i>	4, 6
<i>Crepis runinata</i>	1	<i>Scirpus pungens</i>	5, 6
<i>Cynoslossum officinale</i>	1	<i>Solidago canadensis</i>	1
<i>Dactylis glomerata</i>	7	<i>Solidago occidentalis</i>	1
<i>Deschampsia cespitosa</i>	1, 2, 3, 5	<i>Spartina pectinata</i>	4
<i>Eleocharis palustris</i>	4, 5	<i>Symphoricarpos albus</i>	1
<i>Elymus canadensis</i>	2, 3, 7	<i>Tragopogon dubois</i>	1
<i>Elymus cinereus</i>	7	<i>Trifolium hybridum</i>	1
<i>Epilobium ciliatum</i>	3	<i>Trifolium fragiferum</i>	1
<i>Equisetum arvense</i>	1, 2	<i>Typha latifolia</i>	4, 5, 6
<i>Equisetum hymoides</i>	1, 2	<i>Veronica americana</i>	2
<i>Festuca arundinacea</i>	7	<i>Veronica thapsus</i>	1, 7, 8
<i>Glyceria elata</i>	3, 4, 5		
<i>Glyceria grandis</i>	4, 5, 6		
<i>Glycyrrhiza lepidota</i>	1		
<i>Grindelia squarrosa</i>	1		

Comments / Problems: _____

PLANTED WOODY VEGETATION SURVIVAL

[illegible]

Comments / Problems: Estimated overall survival of the *Salix exigua* cuttings along Big Timber creek is approximately 10% or 250 plants (similar to 2006).

The estimated survival of the transplanted *Populus angustifolia* seedlings is approximately 65% or 851 plants. The young plants are robust and thriving, ranging in height from 2 to 5 feet.

Approximately 392 *Betula occidentalis* plants were transplanted along Big Timber Creek following construction. To date no young plants have been observed but will continue to look for plants during future monitoring visits.

WILDLIFE

Birds

Were man-made nesting structures installed? No

If yes, type of structure: _____ How many? _____

Are the nesting structures being used? NA

Do the nesting structures need repairs? _____

Mammals and Herptiles

Mammal and Herptile Species	Number Observed	Indirect Indication of Use			
		Tracks	Scat	Burrows	Other
White-tailed deer	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Raccoon		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Additional Activities Checklist:

Yes Macroinvertebrate Sampling (if required)

Comments / Problems: Collected a sample from the large open water pond and from Big Timber Creek (see Figure 2)

PHOTOGRAPHS

Using a camera with a 50mm lens and color film take photographs of the following permanent reference points listed in the check list below. Record the direction of the photograph using a compass. When at the site for the first time, establish a permanent reference point by setting a ½ inch rebar or fencepost extending 2-3 feet above ground. Survey the location with a resource grade GPS and mark the location on the aerial photograph.

Photograph Checklist:

- ☒ One photograph for each of the four cardinal directions surrounding the wetland.
- ☒ At least one photograph showing upland use surrounding the wetland. If more than one upland exists then take additional photographs.
- ☒ At least one photograph showing the buffer surrounding the wetland.
- ☒ One photograph from each end of the vegetation transect, showing the transect.

Location	Photograph Frame #	Photograph Description	Compass Reading (°)
A		Big Timber Creek - Transect 1, west side	Southwest
B		Big Timber Creek - Transect 1, bank to bank	South
C		Big Timber Creek - Vegetation re-establishment	North
D		Big Timber Creek - Transect 1, east side CT 2.	East
E		Big Timber Creek new channel	South
F		Big Timber Creek point bar left side of channel	North
G		Big Timber Creek - riverine wetland	Southwest
H		Big Timber Creek - side bar	East
I		Big Timber Creek riverine wetland with woodies	SE
J		Off-channel wetlands - two community types	East
K		Off-channel wetlands - unnamed tributary	East
L		Off-channel wetlands - embankment removal area	East
M		Off-channel wetlands and buffer around pond	SE
N		Off-channel wetlands - Transect 2	West
O		Off-channel wetlands - Transect 2	SE
P		Off-channel wetlands - reduction in bare soil	SW
Q		Off-channel wetlands - far SE corner wetlands	South
C-1		Big Timber Creek - cottonwood seedlings on exposed gravel bars	
A-1		Big Timber Creek – eroding bank	East

Comments / Problems: _____

GPS SURVEYING

Using a resource grade GPS survey the items on the checklist below. Collect at least 3 location points set at a 5 second recording rate. Record file numbers for site in designated GPS field notebook.

GPS Checklist:

- ☒ Jurisdictional wetland boundary.
- ☒ 4-6 landmarks that are recognizable on the aerial photograph.
- ☒ Start and End points of vegetation transect(s).
- ☒ Photograph reference points.
- ☐ Groundwater monitoring well locations.

Comments / Problems: _____

WETLAND DELINEATION

(attach COE delineation forms)

At each site conduct these checklist items:

- ☒ Delineate wetlands according to the 1987 Army COE manual.
- ☒ Delineate wetland – upland boundary onto aerial photograph.
- Yes** Survey wetland – upland boundary with a resource grade GPS survey.

Comments / Problems: _____

FUNCTIONAL ASSESSMENT

(Complete and attach full MDT Montana Wetland Assessment Method field forms.)

(Also attach any completed abbreviated field forms, if used)

Comments / Problems: _____

MAINTENANCE

Were man-made nesting structure installed at this site? **No**

If yes, do they need to be repaired? **NA**

If yes, describe the problems below and indicate if any actions were taken to remedy the problems.

Were man-made structures built or installed to impound water or control water flow into or out of the wetland? **Yes**

If yes, are the structures working properly and in good working order? **Yes**

If no, describe the problems below.

Comments / Problems: _____

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Cloud Ranch - Big Timber Creek** Date: **July 24 2007** Examiner: **CH/PBS&J**

Transect Number: **1** Approximate Transect Length: **195 feet** Compass Direction from Start: **44°** Note: **Perpendicular across bar**

Vegetation Type A: CT 1 (Transitional riparian floodplain)	
Length of transect in this type: 11 feet	
Plant Species	Cover
BROINE	3 = 11-20%
AGRREP	3 = 11-20%
PHLPRA	2 = 6-10%
POPANG (seedlings/root sprouts)	2 = 6-10%
MELOFF	1 = 1-5%
DESCES	1 = 1-5%
AGRALB	1 = 1-5%
SOLCAN	1 = 1-5%
Rock/cobbles	1 = 1-5%
Bare soil	2 = 6-10%
Litter	2 = 6-10%
Total Vegetative Cover:	75%

Vegetation Type B: CT2 (Riverine wetland)	
Length of transect in this type: 82 feet	
Plant Species	Cover
POPANG	4 = 21-50%
AGRALB	3 = 11-20%
DESCES	2 = 6-10%
POAPAL	1 = 1-5%
EQUHYM	1 = 1-5%
SALEXI	1 = 1-5%
AGRREP	1 = 1-5%
CIRARV	1 = 1-5%
Gravels/silts/sediments	3 = 11-20%
Litter	3 = 11-20%
Total Vegetative Cover:	65%

Vegetation Type C: CT 8 (Riverine wetland)	
Length of transect in this type: 70 feet	
Plant Species	Cover
POPANG (seedlings <12 inches tall)	4 = 21-50%
AGRALB	1 = 1-5%
Gravels/silts	5 = >50-%
Total Vegetative Cover:	50%

Vegetation Type D: Gravels	
Length of transect in this type: 2 feet	
Plant Species	Cover
Gravels (un-vegetated)	
Total Vegetative Cover:	0%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Cloud Ranch - Big Timber Creek** Date: **July 24, 2007** Examiner: **CH/PBSJ**

Transect Number: **1** Approximate Transect Length: **195 feet** Compass Direction from Start: **44°** Note: **Perpendicular across bar**

Vegetation Type E: Open water	
Length of transect in this type: 15 feet	
Plant Species	Cover
Open water channel	
Total Vegetative Cover:	0%

Vegetation Type F: Eroding Bank	
Length of transect in this type: 2 feet	
Plant Species	Cover
Roots, bare soil, gravels,	
Total Vegetative Cover:	0%

Vegetation Type G: CT 1 (Transitional riparian floodplain)	
Length of transect in this type: 13 feet	
Plant Species	Cover
BROINE	4 = 21-50%
AGRREP	3 = 11-20%
AGRRIP	2 = 6-10%
SOLCAN	2 = 6-10%
SMYALB	3 = 11-20%
AGRALB	1 = 1-5%
Rock/cobbles	1 = 1-5%
Total Vegetative Cover:	80%

Vegetation Type H:	
Length of transect in this type: feet	
Plant Species	Cover
Total Vegetative Cover:	%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Cloud Ranch - Wetlands** Date: **July 24, 2007** Examiner: **CH/PBSJ**

Transect Number: **2** Approximate Transect Length: **200 feet** Compass Direction from Start: **75°** Note: **SW**

Vegetation Type I: CT 7 (Upland)	
Length of transect in this type: 5 feet	
Plant Species	Cover
BROINE	3 = 11-20%
AGRTRA	3 = 11-20%
AGRREP	3 = 11-20%
BROMAR	2 = 6-10%
AGRALB	3 = 11-20%
CIRARV	+ = < 1%
ELYSAN	1 = 1-5%
PHLPRA	1 = 1-5%
Litter	1 = 1-5%
Bare soil	1 = 1-5%
Total Vegetative Cover:	85%

Vegetation Type J: CT 4 (Restored wetland)	
Length of transect in this type: 187 feet	
Plant Species	Cover
JUNTOR	3 = 11-20%
JUNMER	2 = 6-10%
JUNENS	2 = 6-10%
TYPLAT	3 = 11-20%
AGRALB	2 = 6-10%
CARUTR	2 = 6-10%
CARNEB	2 = 6-10%
ELEPAL	1 = 1-5%
SCIVAL	1 = 1-5%
MENARV	1 = 1-5%
CARAQU, JUNLON	1 = 1-5%
Total Vegetative Cover:	85%

Vegetation Type K: CT 7 (Upland)	
Length of transect in this type: 8 feet	
Plant Species	Cover
BROINE	3 = 11-20%
AGRREP	2 = 6-10%
AGRRIP	3 = 11-20%
AGRTRA	2 = 6-10%
FESARU	3 = 11-20%
PHLPRA	3 = 11-20%
POAPRA	1 = 1-5%
CIRARV	1 = 1-5%
Litter	2 = 6-10%
Bare soil	1 = 1-5%
Total Vegetative Cover:	90%

Vegetation Type L:	
Length of transect in this type:	feet
Plant Species	Cover
Total Vegetative Cover:	%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Cover Estimate

+ = < 1% 3 = 11-20%
1 = 1-5% 4 = 21-50%
2 = 6-10% 5 = > 50%

Indicator Class

+ = Obligate
- = Facultative/Wet
0 = Facultative

Source

P = Planted
V = Volunteer

Percent of perimeter developing wetland vegetation (excluding dam/berm structures): ____%

Establish transects perpendicular to the shoreline (or saturated perimeter). The transect should begin in the upland area. Permanently mark this location with a standard metal fencepost. Extend the imaginary transect line towards the center of the wetland, ending at the 3 foot depth (in open water), or at the point where water depths or saturation are maximized. Mark this location with another metal fencepost.

Estimate cover within a 10 foot wide "belt" along the transect length. At a minimum, establish a transect at the windward and leeward sides of the wetland. Remember that the purpose of this sampling is to monitor, not inventory, representative portions of the wetland site.

Comments: **Transect 1 was established perpendicular to the shoreline (or saturated perimeter). Initially, a 10-foot belt transect was used along this transect to count the number of transplanted woody species along the restored stream channel to determine percent survival/mortality. However, the point where the transect crossed was not representative of the willow cuttings survival noted along the remaining portion of the restored stream channel. Because a complete inventory for woody species was not in the scope of work for this monitoring visit, an estimated percent survival or loss was recorded along the channel to determine an average survival.**

BIRD SURVEY – FIELD DATA SHEET

Site: Cloud Ranch Date: 7/24/07

Survey Time: 9 am to 11 am

[illegible]

BEHAVIOR CODES

BP = One of a breeding pair

BD = Breeding display

F = Foraging

FO = Flyover

L = Loafing

N = Nesting

HABITAT CODES

AB = Aquatic bed

FO = Forested

I = Island

MA = Marsh

MF = Mud Flat

OW = Open Water

SS = Scrub/Shrub

UP = Upland buffer

WM = Wet meadow

US = Unconsolidated shore

Weather: overcast

Notes: STR-Stream Area

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project / Site: Cloud Ranch Applicant / Owner: MDT Investigator: CH/PBSJ	Date: July 24, 2007 County: Sweetgrass State: Montana
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Do Normal Circumstances exist on the site? Yes Is the site significantly disturbed (Atypical Situation)? No Is the area a potential Problem Area? No (If needed, explain on reverse side)	Community ID: Riverine wetland Transect ID: 1 Plot ID: SP-1
---	--

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. <i>POPANG</i> (seedlings)	Tree	FACW	11.		
2. <i>AGRALB</i>	Herb	FACW	12.		
3. <i>POAPAL</i>	Herb	FAC	13.		
4. <i>MELOFF</i>	Herb	FACU	14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 3 / 4 = 75%			FAC Neutral: / = %		
Remarks: 75% hydrophytic vegetation					

HYDROLOGY

Yes Recorded Data (Describe in Remarks): <u>N/A</u> Stream, Lake, or Tide Gauge <u>Yes</u> Aerial Photographs <u>N/A</u> Other No No Recorded Data	Wetland Hydrology Indicators Primary Indicators: <u>NO</u> Inundated <u>YES</u> Saturated in Upper 12 Inches <u>YES</u> Water Marks <u>YES</u> Drift Lines <u>YES</u> Sediment Deposits <u>NO</u> Drainage Patterns in Wetland Secondary Indicators (2 or more required): <u>YES</u> Oxidized Root Channels in Upper 12 inches <u>NO</u> Water-Stained Leaves <u>NO</u> Local Soil Survey Data <u>NO</u> FAC-Neutral Test <u>NO</u> Other (Explain in Remarks)
Field Observations: Depth of Surface Water <u>N/A</u> ____ (in.) Depth to Free Water in Pit <u>N/A</u> ____ (in.) Depth to Saturated Soil = <u>5</u> (in.)	
Remarks: Soils saturated at 5 inches, noted water marks, drift lines and sediment from high flows.	

SOILS

Map Unit Name (Series and Phase): **Nesda-McIlwaine loams, 0-2% slopes**

Map Symbol: _____ Drainage Class: **well-drained** Mapped Hydric Inclusion? **_**

Taxonomy (Subgroup): _____ Field Observations confirm Mapped Type? **No**

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5		10 YR 4/3	/	N/A	Silts, fines
			/	N/A	
6-14		10 YR 5/2	/	N/A	Sandy Clay Loam
			/	N/A	
		/	/	N/A	
			/	N/A	
		/	/	N/A	
			/	N/A	
		/	/	N/A	
			/	N/A	

Hydric Soil Indicators:

NO Histosol

NO Histic Epipedon

NO Sulfidic Odor

NO Aquic Moisture Regime

NO Reducing Conditions

NO Gleyed or Low-Chroma Colors

NO Concretions

NO High Organic Content in Surface Layer in Sandy Soils

NO Organic Streaking in Sandy Soils

NO Listed on Local Hydric Soils List

NO Listed on National Hydric Soils List

YES Other (Explain in Remarks)

Remarks: **High percent gravels and cobbles in the soil profile. Silts and fines in the upper five inches. Soils slightly darker below 6 inches. Soils do not meet the hydric soil indicators but hydric soils will likely develop with time based on proximity to the flowing water.**

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <u>YES</u>	Is this Sampling Point within a Wetland? <u>YES</u>
Wetland Hydrology Present? <u>YES</u>	
Hydric Soils Present? <u>NO</u>	

Remarks: **Area has hydrophytic vegetation and wetland hydrology. Soils will be slower to develop. This is a wetland area subject to seasonal flooding. In 2006, high flows removed vegetation and cover soil, but in turn created a suitable environment for the establishment / deposition of Populus seedlings and a few wetland grasses. This area will likely develop into a CT 2 community type.**

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project / Site: Cloud Ranch Applicant / Owner: MDT Investigator: CH/PBSJ	Date: July 24, 2007 County: Sweetgrass State: Montana
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Do Normal Circumstances exist on the site? Yes Is the site significantly disturbed (Atypical Situation)? No Is the area a potential Problem Area? No (If needed, explain on reverse side)	Community ID: Riparian floodplain Transect ID: 1 Plot ID: SP-2
---	---

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. <i>BROINE</i>	Herb	NI	11.		
2. <i>AGRREP</i>	Herb	FACU	12.		
3. <i>PHLPRA</i>	Herb	FACU	13.		
4. <i>POPANG</i>	Tree	FACW	14.		
5. <i>SOLCAN</i>	Herb	FACU	15.		
6. <i>MELOCC</i>	Herb	FACU	16.		
7. <i>AGRALB</i>	Herb	FACW	17.		
8.			18.		
9.			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 2 / 7 = 28%			FAC Neutral: / = %		
Remarks: 28% hydrophytic vegetation - upland vegetation dominants this higher terrace along Big Timber Creek.					

HYDROLOGY

Yes Recorded Data (Describe in Remarks): N/A Stream, Lake, or Tide Gauge Yes Aerial Photographs N/A Other No No Recorded Data	Wetland Hydrology Indicators Primary Indicators: NO Inundated NO Saturated in Upper 12 Inches NO Water Marks NO Drift Lines NO Sediment Deposits NO Drainage Patterns in Wetland Secondary Indicators (2 or more required): NO Oxidized Root Channels in Upper 12 inches NO Water-Stained Leaves NO Local Soil Survey Data NO FAC-Neutral Test NO Other (Explain in Remarks)
Field Observations: Depth of Surface Water N/A ____ (in.) Depth to Free Water in Pit N/A ____ (in.) Depth to Saturated Soil > 12 (in.)	
Remarks: Soils were moist at 10 inches but not saturated.	

SOILS

Map Unit Name (Series and Phase): **Nesda-McIlwaine loams, 0-2% slopes**

Map Symbol: _____ Drainage Class: **well-drained** Mapped Hydric Inclusion? **_**

Taxonomy (Subgroup): _____ Field Observations confirm Mapped Type? **Yes**

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10 YR 5/2	/	N/A	Silt Loam
			/	N/A	
6-12	A	10 YR 4/2	7.5 YR 4/6	Few Faint	Silty Clay Loam
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	

Hydric Soil Indicators:

NO Histosol

NO Histic Epipedon

NO Sulfidic Odor

NO Aquic Moisture Regime

NO Reducing Conditions

YES Gleyed or Low-Chroma Colors

NO Concretions

NO High Organic Content in Surface Layer in Sandy Soils

NO Organic Streaking in Sandy Soils

NO Listed on Local Hydric Soils List

NO Listed on National Hydric Soils List

NO Other (Explain in Remarks)

Remarks: **Low chroma values and mottles .**

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <u>NO</u>	Is this Sampling Point within a Wetland? <u>NO</u>
Wetland Hydrology Present? <u>NO</u>	
Hydric Soils Present? <u>YES</u>	
Remarks: Upland terrace along Big Timber Creek. Hydric soils but hydrology and vegetation do not meet wetland criteria.	

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project / Site: Cloud Ranch Applicant / Owner: MDT Investigator: CH/PBSJ	Date: July 24, 2007 County: Sweetgrass State: Montana
---	--

Do Normal Circumstances exist on the site? Yes Is the site significantly disturbed (Atypical Situation)? No Is the area a potential Problem Area? No (If needed, explain on reverse side)	Community ID: Restored wetland Transect ID: 2 Plot ID: SP-3
---	--

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. <i>BROINE</i>	Herb	NI	11.		
2. <i>AGRREP</i>	Herb	FACU	12.		
3. <i>AGRRIP</i>	Herb	NI	13.		
4. <i>AGRTRA</i>	Herb	FAC	14.		
5. <i>BROMAR</i>	Herb	NI	15.		
6. <i>ELYCAN</i>	Herb	FAC	16.		
7. <i>FESARU</i>	Herb	FACU	17.		
8.			18.		
9.			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 2 / 7 = 28%			FAC Neutral: / = %		
Remarks: This area will likely remain a buffer area around the wetland perimeter. Improved species diversity and cover compared to 2005. Cirsium arvense was sprayed in 2006 but young plants were observed in 2007.					

HYDROLOGY

Yes Recorded Data (Describe in Remarks): N/A Stream, Lake, or Tide Gauge Yes Aerial Photographs N/A Other No No Recorded Data	Wetland Hydrology Indicators Primary Indicators: NO Inundated NO Saturated in Upper 12 Inches NO Water Marks NO Drift Lines NO Sediment Deposits NO Drainage Patterns in Wetland Secondary Indicators (2 or more required): NO Oxidized Root Channels in Upper 12 inches NO Water-Stained Leaves NO Local Soil Survey Data NO FAC-Neutral Test NO Other (Explain in Remarks)
Field Observations: Depth of Surface Water N/A ____ (in.) Depth to Free Water in Pit N/A ____ (in.) Depth to Saturated Soil > 12 (in.)	
Remarks: Soils were dry in the upper 12 inches.	

SOILS

Map Unit Name (Series and Phase): Nesda-McIlwaine loams, 0-2% slopes					
Map Symbol: _____ Drainage Class: well-drained Mapped Hydric Inclusion? _					
Taxonomy (Subgroup): _____ Field Observations confirm Mapped Type? No					
Profile Description					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10 YR 5/1	/ /	N/A N/A	Organics/roots
2-12	A	10 YR 5/2	/ /	N/A N/A	Silty loam
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	

Hydric Soil Indicators:

<u>NO</u> Histosol <u>NO</u> Histic Epipedon <u>NO</u> Sulfidic Odor <u>NO</u> Aquic Moisture Regime <u>NO</u> Reducing Conditions <u>NO</u> Gleyed or Low-Chroma Colors	<u>NO</u> Concretions <u>NO</u> High Organic Content in Surface Layer in Sandy Soils <u>NO</u> Organic Streaking in Sandy Soils <u>NO</u> Listed on Local Hydric Soils List <u>NO</u> Listed on National Hydric Soils List <u>NO</u> Other (Explain in Remarks)
---	--

Remarks: **Hydric soil indicators were not noted.**

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <u>NO</u>	Is this Sampling Point within a Wetland? <u>NO</u>
Wetland Hydrology Present? <u>NO</u>	
Hydric Soils Present? <u>NO</u>	
Remarks: Species diversity and cover by desirable species continues to improve compared to 2004 and 2005.	

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project / Site: Cloud Ranch Applicant / Owner: MDT Investigator: CH/PBSJ	Date: July 24, 2007 County: Sweetgrass State: Montana
---	--

Do Normal Circumstances exist on the site? Yes Is the site significantly disturbed (Atypical Situation)? No Is the area a potential Problem Area? No (If needed, explain on reverse side)	Community ID: Restored wetland Transect ID: 2 Plot ID: SP-4
---	--

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. <i>AGRALB</i>	Herb	FACW	11.		
2. <i>JUNTOR</i>	Herb	FACW	12.		
3. <i>JUNENS</i>	Herb	FACW	13.		
4. <i>TYPLAT</i>	Herb	OBL	14.		
5. <i>JUNMER</i>	Herb	OBL	15.		
6. <i>GLYGRA</i>	Herb	OBL	16.		
7. <i>CARNEB</i>	Herb	OBL	17.		
8. <i>CARAQU</i>	Herb	OBL	18.		
9. <i>MENARV</i>	Herb	FACW-	19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 9 / 9 = 100%			FAC Neutral: / = %		
Remarks: Diverse wetland vegetation.					

HYDROLOGY

Yes Recorded Data (Describe in Remarks): <u>N/A</u> Stream, Lake, or Tide Gauge <u>Yes</u> Aerial Photographs <u>N/A</u> Other No No Recorded Data	Wetland Hydrology Indicators Primary Indicators: <u>NO</u> Inundated <u>YES</u> Saturated in Upper 12 Inches <u>NO</u> Water Marks <u>NO</u> Drift Lines <u>NO</u> Sediment Deposits <u>NO</u> Drainage Patterns in Wetland Secondary Indicators (2 or more required): <u>NO</u> Oxidized Root Channels in Upper 12 inches <u>NO</u> Water-Stained Leaves <u>NO</u> Local Soil Survey Data <u>NO</u> FAC-Neutral Test <u>NO</u> Other (Explain in Remarks)
Field Observations: Depth of Surface Water <u>N/A</u> ____ (in.) Depth to Free Water in Pit <u>N/A</u> ____ (in.) Depth to Saturated Soil = <u>6</u> (in.)	
Remarks: Soils were dry on the surface but saturated at 6 inches.	

SOILS

Map Unit Name (Series and Phase): Nesda-McIlwaine loams, 0-2% slopes					
Map Symbol: _____ Drainage Class: well-drained Mapped Hydric Inclusion? _					
Taxonomy (Subgroup): _____ Field Observations confirm Mapped Type? No					
Profile Description					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12	A/B	10 YR 3/2	10 YR 5/6 /	Few Faint	Clay loam
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
Hydric Soil Indicators: <div style="display: flex; justify-content: space-between;"> <div> <u>NO</u> Histosol <u>NO</u> Histic Epipedon <u>NO</u> Sulfidic Odor <u>NO</u> Aquic Moisture Regime <u>NO</u> Reducing Conditions <u>YES</u> Gleyed or Low-Chroma Colors </div> <div> <u>NO</u> Concretions <u>NO</u> High Organic Content in Surface Layer in Sandy Soils <u>NO</u> Organic Streaking in Sandy Soils <u>NO</u> Listed on Local Hydric Soils List <u>NO</u> Listed on National Hydric Soils List <u>NO</u> Other (Explain in Remarks) </div> </div>					
Remarks: Mottles present at 6 inches. .					

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <u>YES</u>	Is this Sampling Point within a Wetland? <u>YES</u>
Wetland Hydrology Present? <u>YES</u>	
Hydric Soils Present? <u>YES</u>	
Remarks: There is less surface water in this sampling area compared to 2006 but an increase in vegetation cover (less bare or sparsely vegetated areas) and an interesting shift in the cover of <i>Juncus torreyi</i> to include other <i>Juncus</i> sp., <i>Carex</i> sp. and <i>Agrostis alba</i>.	

MDT MONTANA WETLAND ASSESSMENT FORM (revised May 25, 1999)

1. Project Name: Cloud Ranch 2. Project #: STPX 0049(021) Control #: 5231
 3. Evaluation Date: 7/24/2007 4. Evaluator(s): CH/PBSJ 5. Wetland / Site #(s): Big Timber Creek
 6. Wetland Location(s) i. T: 3 N R: 13 E S: 36 T: N R: E S:
 ii. Approx. Stationing / Mileposts:
 iii. Watershed: 13 GPS Reference No. (if applies):
 Other Location Information:

7. A. Evaluating Agency MDT 8. Wetland Size (total acres): (visually estimated)
1.1 (measured, e.g. GPS)
 B. Purpose of Evaluation:
☐ Wetlands potentially affected by MDT project 9. Assessment Area (total acres): 3.27 ac (visually estimated)
☐ Mitigation wetlands; pre-construction (measured, e.g. GPS)
☒ Mitigation wetlands; post-construction
☐ Other

10. CLASSIFICATION OF WETLAND AND AQUATIC HABITATS IN AA

HGM CLASS ¹	SYSTEM ²	SUBSYSTEM ²	CLASS ²	WATER REGIME ²	MODIFIER ²	% OF AA
Riverine	Riverine	Lower Perennial	Rock Bottom	Permanently Flooded	---	60
Riverine	Palustrine	None	Emergent Wetland	Seasonally Flooded	Excavated	20
Riverine	Palustrine	None	Scrub-Shrub Wetland	Seasonally Flooded	---	20
---	---	---	---	---	---	

¹ = Smith et al. 1995. ² = Cowardin et al. 1979.

11. ESTIMATED RELATIVE ABUNDANCE (of similarly classified sites within the same Major Montana Watershed Basin)
 Common **Comments:**

12. GENERAL CONDITION OF AA

i. Regarding Disturbance: (Use matrix below to select appropriate response.)

Conditions Within AA	Predominant Conditions Adjacent (within 500 Feet) To AA		
	Land managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or buildings.	Land not cultivated, but moderately grazed or hayed or selectively logged or has been subject to minor clearing; contains few roads or buildings.	Land cultivated or heavily grazed or logged; subject to substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.
AA occurs and is managed in predominantly a natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or occupied buildings.	---	low disturbance	---
AA not cultivated, but moderately grazed or hayed or selectively logged or has been subject to relatively minor clearing, or fill placement, or hydrological alteration; contains few roads or buildings.	---	---	---
AA cultivated or heavily grazed or logged; subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.	---	---	---

Comments: (types of disturbance, intensity, season, etc.)

ii. Prominent weedy, alien, & introduced species: Canada thistle, houndstongue, spotted knapweed, mullein, burdock and toad flax.

iii. Briefly describe AA and surrounding land use / habitat: this AA includes Big Timber Creek and adjacent wetlands

13. STRUCTURAL DIVERSITY (Based on 'Class' column of #10 above.)

Number of 'Cowardin' Vegetated Classes Present in AA	≥3 Vegetated Classes or ≥ 2 if one class is forested	2 Vegetated Classes or 1 if forested	≤ 1 Vegetated Class
Select Rating	---	Moderate	---

Comments: There are areas along the channel where cottonwoods has reached the height and density to qualify as shrub-scrub.

14A. HABITAT FOR FEDERALLY LISTED OR PROPOSED THREATENED OR ENDANGERED PLANTS AND ANIMALS

i. AA is Documented (D) or Suspected (S) to contain (check box):

Primary or Critical habitat (**list species**) ☐ D ☐ S
 Secondary habitat (**list species**) ☐ D ☐ S
 Incidental habitat (**list species**) ☐ D ☐ S
 No usable habitat ☐ D ☒ S

ii. **Rating** (Based on the strongest habitat chosen in 14A(i) above, find the corresponding rating of High (H), Moderate (M), or Low (L) for this function.

Highest Habitat Level	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point and Rating	---	---	---	---	---	---	0 (L)

If documented, list the source (e.g., observations, records, etc.): Bald eagle was de-listed in 2007.

14B. HABITAT FOR PLANTS AND ANIMALS RATED AS S1, S2, OR S3 BY THE MONTANA NATURAL HERITAGE PROGRAM.

Do not include species listed in 14A(i).

i. AA is Documented (D) or Suspected (S) to contain (check box):

Primary or Critical habitat (**list species**) ☐ D ☐ S _____
 Secondary habitat (**list species**) ☐ D ☒ S yellowstone cutthroat
 Incidental habitat (**list species**) ☐ D ☒ S Bald Eagle
 No usable habitat ☐ D ☐ S _____

iii. **Rating** (Based on the strongest habitat chosen in 14B(i) above, find the corresponding rating of High (H), Moderate (M), or Low (L) for this function.

Highest Habitat Level:	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point and Rating	---	---	---	.6 (M)	---	---	---

If documented, list the source (e.g., observations, records, etc.): _____

14C. General Wildlife Habitat Rating

i. **Evidence of overall wildlife use in the AA:** (Check either substantial, moderate, or low)

☐ **Substantial** (based on any of the following)

- ☐ observations of abundant wildlife #s or high species diversity (during any period)
- ☐ abundant wildlife sign such as scat, tracks, nest structures, game trails, etc.
- ☐ presence of extremely limiting habitat features not available in the surrounding area
- ☐ interviews with local biologists with knowledge of the AA

☐ **Low** (based on any of the following)

- ☐ few or no wildlife observations during peak use periods
- ☐ little to no wildlife sign
- ☐ sparse adjacent upland food sources
- ☐ interviews with local biologists with knowledge of AA

☐ **Moderate** (based on any of the following)

- ☒ observations of scattered wildlife groups or individuals or relatively few species during peak periods
- ☒ common occurrence of wildlife sign such as scat, tracks, nest structures, game trails, etc.
- ☐ adequate adjacent upland food sources
- ☐ interviews with local biologists with knowledge of the AA

ii. **Wildlife Habitat Features** (Working from top to bottom, select appropriate AA attributes to determine the exceptional (E), high (H), moderate (M), or low (L) rating. Structural diversity is from #13. For class cover to be considered evenly distributed, vegetated classes must be within 20% of each other in terms of their percent composition in the AA (see #10). Duration of Surface Water: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; A = absent.

Structural Diversity (from #13)	<input type="checkbox"/> High								<input checked="" type="checkbox"/> Moderate								<input type="checkbox"/> Low			
Class Cover Distribution (all vegetated classes)	<input type="checkbox"/> Even				<input type="checkbox"/> Uneven				<input checked="" type="checkbox"/> Even				<input type="checkbox"/> Uneven				<input type="checkbox"/> Even			
Duration of Surface Water in ≥ 10% of AA	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A
Low disturbance at AA (see #12)	--	--	--	--	--	--	--	--	E	--	--	--	--	--	--	--	--	--	--	--
Moderate disturbance at AA (see #12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
High disturbance at AA (see #12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

iii. **Rating** (Using 14C(i) and 14C(ii) above and the matrix below to arrive at the functional point and rating of exceptional (E), high (H), moderate (M), or low (L) for this function.)

Evidence of Wildlife Use from 14C(i)	Wildlife Habitat Features Rating from 14C(ii)			
	<input checked="" type="checkbox"/> Exceptional	<input type="checkbox"/> High	<input type="checkbox"/> Moderate	<input type="checkbox"/> Low
Substantial	--	--	--	--
Moderate	.9 (H)	--	--	--
Low	--	--	--	--

Comments: _____

14D. GENERAL FISH/AQUATIC HABITAT RATING ☐ NA (proceed to 14E)

If the AA is not or was not historically used by fish due to lack of habitat, excessive gradient, then check the NA box above.

Assess if the AA is used by fish or the existing situation is "correctable" such that the AA could be used by fish [e.g. fish use is precluded by perched culvert or other barrier, etc.]. If fish use occurs in the AA but is not desired from a resource management perspective (e.g. fish use within an irrigation canal), then Habitat Quality [14D(i)] below should be marked as "Low", applied accordingly in 14D(ii) below, and noted in the comments.

i. **Habitat Quality** (Pick the appropriate AA attributes in matrix to pick the exceptional (E), high (H), moderate (M), or low (L) quality rating.)

Duration of Surface Water in AA	<input checked="" type="checkbox"/> Permanent/Perennial			<input type="checkbox"/> Seasonal / Intermittent			<input type="checkbox"/> Temporary / Ephemeral		
Cover - % of waterbody in AA containing cover objects (e.g. submerged logs, large rocks & boulders, overhanging banks, floating-leaved vegetation)	>25%	10-25%	<10%	>25%	10-25%	<10%	>25%	10-25%	<10%
Shading - >75% of streambank or shoreline of AA contains riparian or wetland scrub-shrub or forested communities	--	--	--	--	--	--	--	--	--
Shading - 50 to 75% of streambank or shoreline of AA contains riparian or wetland scrub-shrub or forested communities.	--	--	--	--	--	--	--	--	--
Shading - < 50% of streambank or shoreline of AA contains riparian or wetland scrub-shrub or forested communities.	--	M	--	--	--	--	--	--	--

ii. **Modified Habitat Quality:** Is fish use of the AA precluded or significantly reduced by a culvert, dike, other man-made structure or activity or is the waterbody included on the 'MDEQ list of waterbodies in need of TMDL development' with 'Probable Impaired Uses' listed as cold or warm water fishery or aquatic life support?

☐ Y ☒ N If yes, reduce the rating from 14D(i) by one level and check the modified habitat quality rating: ☐ E ☐ H ☐ M ☐ L

iii. **Rating** (Use the conclusions from 14D(i) and 14D(ii) above and the matrix below to pick the functional point and rating of exceptional (E), high (H), moderate (M), or low (L).)

Types of Fish Known or Suspected Within AA	Modified Habitat Quality from 14D(ii)			
	<input type="checkbox"/> Exceptional	<input type="checkbox"/> High	<input checked="" type="checkbox"/> Moderate	<input type="checkbox"/> Low
Native game fish	--	--	.7 (M)	--
Introduced game fish	--	--	--	--
Non-game fish	--	--	--	--
No fish	--	--	--	--

Comments: _____

14E. FLOOD ATTENUATION ☐ NA (proceed to 14G)

Applies only to wetlands subject to flooding via in-channel or overbank flow.

If wetlands in AA do not flooded from in-channel or overbank flow, check NA above.

i. **Rating** (Working from top to bottom, mark the appropriate attributes to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.)

Estimated wetland area in AA subject to periodic flooding	<input type="checkbox"/> ≥ 10 acres			<input checked="" type="checkbox"/> <10, >2 acres			<input type="checkbox"/> ≤2 acres		
% of flooded wetland classified as forested, scrub/shrub, or both	75%	25-75%	<25%	75%	25-75%	<25%	75%	25-75%	<25%
AA contains no outlet or restricted outlet	--	--	--	--	--	--	--	--	--
AA contains unrestricted outlet	--	--	--	--	--	.4 (M)	--	--	--

ii. **Are residences, businesses, or other features which may be significantly damaged by floods located within 0.5 miles downstream of the AA?** (check)

☒ Y ☐ N Comments: homes, ranches

14F. SHORT AND LONG TERM SURFACE WATER STORAGE ☐ NA (proceed to 14G)

Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow.

If no wetlands in the AA are subject to flooding or ponding, check NA above.

i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.)

Abbreviations: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral.

Estimated maximum acre feet of water contained in wetlands within the AA that are subject to periodic flooding or ponding.	<input type="checkbox"/> >5 acre feet			<input checked="" type="checkbox"/> <5, >1 acre feet			<input type="checkbox"/> ≤1 acre foot		
Duration of surface water at wetlands within the AA	P/P	S/I	T/E	P/P	S/I	T/E	P/P	S/I	T/E
Wetlands in AA flood or pond ≥ 5 out of 10 years	--	--	--	--	.6 (M)	--	--	--	--
Wetlands in AA flood or pond < 5 out of 10 years	--	--	--	--	--	--	--	--	--

Comments: _____

14G. SEDIMENT/NUTRIENT/TOXICANT RETENTION AND REMOVAL ☐ NA (proceed to 14H)

Applies to wetlands with potential to receive excess sediments, nutrients, or toxicants through influx of surface or ground water or direct input.

If no wetlands in the AA are subject to such input, check NA above.

i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.)

Sediment, Nutrient, and Toxicant Input Levels Within AA	AA receives or surrounding land use has potential to deliver low to moderate levels of sediments, nutrients, or compounds such that other functions are not substantially impaired. Minor sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.				Waterbody on MDEQ list of waterbodies in need of TMDL development for "probable causes" related to sediment, nutrients, or toxicants or AA receives or surrounding land use has potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.			
% cover of wetland vegetation in AA	<input checked="" type="checkbox"/> ≥ 70%		<input type="checkbox"/> < 70%		<input type="checkbox"/> ≥ 70%		<input type="checkbox"/> < 70%	
Evidence of flooding or ponding in AA	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
AA contains no or restricted outlet	--	--	--	--	--	--	--	--
AA contains unrestricted outlet	.9 (H)	--	--	--	--	--	--	--

Comments: _____

14H. SEDIMENT/ShORELINE STABILIZATION☐ **NA** (proceed to 14I)

Applies only if AA occurs on or within the banks of a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body that is subject to wave action. If this does not apply, check NA above.

- i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating exceptional (E), high (H), moderate (M), or low (L) for this function.

% Cover of wetland streambank or shoreline by species with deep, binding rootmasses.	Duration of Surface Water Adjacent to Rooted Vegetation		
	<input checked="" type="checkbox"/> Permanent / Perennial	<input type="checkbox"/> Seasonal / Intermittent	<input type="checkbox"/> Temporary / Ephemeral
≥ 65 %	--	--	--
35-64 %	.7 (M)	--	--
< 35 %	--	--	--

Comments:

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT

- i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.
A = acreage of vegetated component in the AA. **B** = structural diversity rating from #13. **C** = Yes (Y) or No (N) as to whether or not the AA contains a surface or subsurface outlet; **P/P** = permanent/perennial; **S/I** = seasonal/intermittent; **T/E/A** = temporary/ephemeral/absent.

A	<input type="checkbox"/> Vegetated component >5 acres						<input checked="" type="checkbox"/> Vegetated component 1-5 acres						<input type="checkbox"/> Vegetated component <1 acre					
B	<input type="checkbox"/> High		<input type="checkbox"/> Moderate		<input type="checkbox"/> Low		<input type="checkbox"/> High		<input checked="" type="checkbox"/> Moderate		<input type="checkbox"/> Low		<input type="checkbox"/> High		<input type="checkbox"/> Moderate		<input type="checkbox"/> Low	
C	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N
P/P	--	--	--	--	--	--	--	--	.8H	--	--	--	--	--	--	--	--	--
S/I	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
T/E/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Comments:

14J. GROUNDWATER DISCHARGE/RECHARGE (D/R) (Check the indicators in i & ii below that apply to the AA)i. ☐ **Discharge Indicators**

- ☒ Springs are known or observed.
☐ Vegetation growing during dormant season/drought.
☐ Wetland occurs at the toe of a natural slopes.
☐ Seeps are present at the wetland edge.
☐ AA permanently flooded during drought periods.
☐ Wetland contains an outlet, but no inlet.
☐ Other

ii. ☐ **Recharge Indicators**

- ☒ Permeable substrate presents without underlying impeding layer.
☐ Wetland contains inlet but not outlet.
☐ Other

- iii. **Rating:** Use the information from 14J(i) and 14J(ii) above and the table below to arrive at the functional point and rating of high (H) or low (L) for this function.

Criteria	Functional Point and Rating
AA has known Discharge/Recharge area or one or more indicators of D/R present	1 (H)
No Discharge/Recharge indicators present	--
Available Discharge/Recharge information inadequate to rate AA D/R potential	--

Comments:

14K. UNIQUENESS

- i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.

Replacement Potential	AA contains fen, bog, warm springs or mature (>80 yr-old) forested wetland or plant association listed as "S1" by the MTNHP.			AA does not contain previously cited rare types and structural diversity (#13) is high or contains plant association listed as "S2" by the MTNHP.			AA does not contain previously cited rare types or associations and structural diversity (#13) is low-moderate.		
Estimated Relative Abundance from #11	<input type="checkbox"/> rare	<input type="checkbox"/> common	<input type="checkbox"/> abundant	<input type="checkbox"/> rare	<input type="checkbox"/> common	<input type="checkbox"/> abundant	<input type="checkbox"/> rare	<input checked="" type="checkbox"/> common	<input type="checkbox"/> abundant
Low disturbance at AA (#12i)	--	--	--	--	--	--	--	.4M	--
Moderate disturbance at AA (#12i)	--	--	--	--	--	--	--	--	--
High disturbance at AA (#12i)	--	--	--	--	--	--	--	--	--

Comments: 80 yr old cottonwood forest should be acknowledged in this rating.

14L. RECREATION / EDUCATION POTENTIAL

- i. **Is the AA a known recreational or educational site?** ☐ **Yes** (Rate ☐ **High (1.0)**, then proceed to 14L(ii) only] ☒ **No** [Proceed to 14L(iii)]
ii. **Check categories that apply to the AA:** ☐ Educational / scientific study ☒ Consumptive rec. ☐ Non-consumptive rec. ☐ Other
iii. **Based on the location, diversity, size, and other site attributes, is there a strong potential for recreational or educational use?**
☒ **Yes** [Proceed to 14L (ii) and then 14L(iv).] ☐ **No** [Rate as low in 14L(iv)]

- iv. **Rating** (Use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.

Ownership	Disturbance at AA from #12(i)		
	<input checked="" type="checkbox"/> Low	<input type="checkbox"/> Moderate	<input type="checkbox"/> High
Public ownership	--	--	--
Private ownership	.7(M)	--	--

Comments: _____

FUNCTION, VALUE SUMMARY, AND OVERALL RATING

Function and Value Variables	Rating	Actual Functional Points	Possible Functional Points	Functional Units (Actual Points x Estimated AA Acreage)
A. Listed/Proposed T&E Species Habitat	L	0.00	1	
B. MT Natural Heritage Program Species Habitat	M	0.60	1	
C. General Wildlife Habitat	H	0.90	1	
D. General Fish/Aquatic Habitat	M	0.70	1	
E. Flood Attenuation	M	0.40	1	
F. Short and Long Term Surface Water Storage	M	0.60	1	
G. Sediment/Nutrient/Toxicant Removal	H	0.90	1	
H. Sediment/Shoreline Stabilization	M	0.70	1	
I. Production Export/Food Chain Support	H	0.80	1	
J. Groundwater Discharge/Recharge	H	1.00	1	
K. Uniqueness	M	0.40	1	
L. Recreation/Education Potential	M	0.70	1	
Totals:		7.70	12.00	
Percent of Total Possible Points:			64% (Actual / Possible) x 100 [rd to nearest whole #]	

Category I Wetland: (Must satisfy **one** of the following criteria. If not proceed to Category II.)

- ☐ Score of 1 functional point for Listed/Proposed Threatened or Endangered Species; **or**
☐ Score of 1 functional point for Uniqueness; **or**
☐ Score of 1 functional point for Flood Attenuation **and** answer to Question 14E(ii) is "yes"; **or**
☐ Percent of total Possible Points is > 80%.

Category II Wetland: (Criteria for Category I not satisfied **and** meets any **one** of the following Category II criteria. If not satisfied, proceed to Category IV.)

- ☐ Score of 1 functional point for Species Rated S1, S2, or S3 by the MT Natural Heritage Program; **or**
☒ Score of .9 or 1 functional point for General Wildlife Habitat; **or**
☐ Score of .9 or 1 functional point for General Fish/Aquatic Habitat; **or**
☐ "High" to "Exceptional" ratings for **both** General Wildlife Habitat **and** General Fish / Aquatic Habitat; **or**
☐ Score of .9 functional point for Uniqueness; **or**
☐ Percent of total possible points is > 65%.

☐ **Category III Wetland:** (Criteria for Categories I, II, or IV not satisfied.)

Category IV Wetland: (Criteria for Categories I or II are not satisfied **and** all of the following criteria are met; If not satisfied, proceed to Category III.)

- ☐ "Low" rating for Uniqueness; **and**
☐ "Low" rating for Production Export / Food Chain Support; **and**
☐ Percent of total possible points is < 30%.

OVERALL ANALYSIS AREA (AA) RATING: (Check appropriate category based on the criteria outlined above.)

☐ **I**
☒ **II**
☐ **III**
☐ **IV**

1. Project Name: Cloud Ranch 2. Project #: STPX 0049(021) Control #: 5231

3. Evaluation Date: 7/24/2007 4. Evaluator(s): CH/PBSJ 5. Wetland / Site #(s): off-channel wetlands

6. Wetland Location(s) i. T: 3 N R: 13 E S: 36 T: __ N R: __ E S: _____

ii. Approx. Stationing / Mileposts: _____

iii. Watershed: 13 GPS Reference No. (if applies): _____

Other Location Information: _____

8. Wetland Size (total acres): _____ (visually estimated)
1.97 ac (measured, e.g. GPS)

☐ Wetlands potentially affected by MDT project
☐ Mitigation wetlands; pre-construction
☒ Mitigation wetlands; post-construction
☐ Other

9. Assessment Area (total acres): _____ (visually estimated)
2.93 ac (measured, e.g. GPS)

HGM CLASS ¹	SYSTEM ²	SUBSYSTEM ²	CLASS ²	WATER REGIME ²	MODIFIER ²	% OF AA
Depression	Palustrine	None	Emergent Wetland	Seasonally Flooded	Excavated	95
Riverine	Riverine	Upper Perennial	Unconsolidated Bottom	Permanently Flooded	---	5
---	---	---	---	---	---	
---	---	---	---	---	---	

¹ = Smith et al. 1995. ² = Cowardin et al. 1979.

Common **Comments:** Under modifier, as part of the creation/restoration activities, wetlands have been created by excavated and shallow dikes.

i. Regarding Disturbance: (Use matrix below to select appropriate response.)

Conditions Within AA	Predominant Conditions Adjacent (within 500 Feet) To AA		
	Land managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or buildings.	Land not cultivated, but moderately grazed or hayed or selectively logged or has been subject to minor clearing; contains few roads or buildings.	Land cultivated or heavily grazed or logged; subject to substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.
AA occurs and is managed in predominantly a natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or occupied buildings.	---	low disturbance	---
AA not cultivated, but moderately grazed or hayed or selectively logged or has been subject to relatively minor clearing, or fill placement, or hydrological alteration; contains few roads or buildings.	---	---	---
AA cultivated or heavily grazed or logged; subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.	---	---	---

Comments: (types of disturbance, intensity, season, etc.) _____

ii. **Prominent weedy, alien, & introduced species:** Canada thistle, houndstongue, and mullein.

iii. Briefly describe AA and surrounding land use / habitat: this AA is for the off-channel wetlands

Number of 'Cowardin' Vegetated Classes Present in AA	≥3 Vegetated Classes or ≥ 2 if one class is forested	2 Vegetated Classes or 1 if forested	≤ 1 Vegetated Class
Select Rating	---	---	Low

Comments:

14A. HABITAT FOR FEDERALLY LISTED OR PROPOSED THREATENED OR ENDANGERED PLANTS AND ANIMALS

i. AA is Documented (D) or Suspected (S) to contain (check box):

Primary or Critical habitat (**list species**) ☐ D ☐ S
 Secondary habitat (**list species**) ☐ D ☐ S
 Incidental habitat (**list species**) ☐ D ☐ S
 No usable habitat ☐ D ☒ S

ii. **Rating** (Based on the strongest habitat chosen in 14A(i) above, find the corresponding rating of High (H), Moderate (M), or Low (L) for this function.

Highest Habitat Level	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point and Rating	---	---	---	---	---	---	0 (L)

If documented, list the source (e.g., observations, records, etc.): Bald Eagle delisted in 2007.

14B. HABITAT FOR PLANTS AND ANIMALS RATED AS S1, S2, OR S3 BY THE MONTANA NATURAL HERITAGE PROGRAM.

Do not include species listed in 14A(i).

i. AA is Documented (D) or Suspected (S) to contain (check box):

Primary or Critical habitat (**list species**) ☐ D ☐ S _____
 Secondary habitat (**list species**) ☐ D ☐ S _____
 Incidental habitat (**list species**) ☐ D ☒ S Peregrine Falcon, Bald Eagle
 No usable habitat ☐ D ☐ S _____

iii. **Rating** (Based on the strongest habitat chosen in 14B(i) above, find the corresponding rating of High (H), Moderate (M), or Low (L) for this function.

Highest Habitat Level:	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point and Rating	---	---	---	---	---	.1 (L)	---

If documented, list the source (e.g., observations, records, etc.): _____

14C. General Wildlife Habitat Rating

i. **Evidence of overall wildlife use in the AA:** (Check either substantial, moderate, or low)

☐ **Substantial** (based on any of the following)

- ☐ observations of abundant wildlife #s or high species diversity (during any period)
- ☐ abundant wildlife sign such as scat, tracks, nest structures, game trails, etc.
- ☐ presence of extremely limiting habitat features not available in the surrounding area
- ☐ interviews with local biologists with knowledge of the AA

☐ **Low** (based on any of the following)

- ☐ few or no wildlife observations during peak use periods
- ☐ little to no wildlife sign
- ☐ sparse adjacent upland food sources
- ☐ interviews with local biologists with knowledge of AA

☐ **Moderate** (based on any of the following)

- ☒ observations of scattered wildlife groups or individuals or relatively few species during peak periods
- ☒ common occurrence of wildlife sign such as scat, tracks, nest structures, game trails, etc.
- ☐ adequate adjacent upland food sources
- ☐ interviews with local biologists with knowledge of the AA

ii. **Wildlife Habitat Features** (Working from top to bottom, select appropriate AA attributes to determine the exceptional (E), high (H), moderate (M), or low (L) rating. Structural diversity is from #13. For class cover to be considered evenly distributed, vegetated classes must be within 20% of each other in terms of their percent composition in the AA (see #10). Duration of Surface Water: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; A = absent.

Structural Diversity (from #13)	<input type="checkbox"/> High								<input type="checkbox"/> Moderate								<input checked="" type="checkbox"/> Low			
Class Cover Distribution (all vegetated classes)	<input type="checkbox"/> Even				<input type="checkbox"/> Uneven				<input type="checkbox"/> Even				<input type="checkbox"/> Uneven				<input checked="" type="checkbox"/> Even			
Duration of Surface Water in ≥ 10% of AA	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A
Low disturbance at AA (see #12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	H	--	--
Moderate disturbance at AA (see #12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
High disturbance at AA (see #12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

iii. **Rating** (Using 14C(i) and 14C(ii) above and the matrix below to arrive at the functional point and rating of exceptional (E), high (H), moderate (M), or low (L) for this function.)

Evidence of Wildlife Use from 14C(i)	Wildlife Habitat Features Rating from 14C(ii)			
	<input type="checkbox"/> Exceptional	<input checked="" type="checkbox"/> High	<input type="checkbox"/> Moderate	<input type="checkbox"/> Low
Substantial	--	--	--	--
Moderate	--	.7 (M)	--	--
Low	--	--	--	--

Comments: _____

14D. GENERAL FISH/AQUATIC HABITAT RATING ☒ **NA** (proceed to 14E)

If the AA is not or was not historically used by fish due to lack of habitat, excessive gradient, then check the NA box above.

Assess if the AA is used by fish or the existing situation is "correctable" such that the AA could be used by fish [e.g. fish use is precluded by perched culvert or other barrier, etc.]. If fish use occurs in the AA but is not desired from a resource management perspective (e.g. fish use within an irrigation canal), then Habitat Quality [14D(i)] below should be marked as "Low", applied accordingly in 14D(ii) below, and noted in the comments.

i. **Habitat Quality** (Pick the appropriate AA attributes in matrix to pick the exceptional (E), high (H), moderate (M), or low (L) quality rating.)

Duration of Surface Water in AA	<input type="checkbox"/> Permanent/Perennial			<input type="checkbox"/> Seasonal / Intermittent			<input type="checkbox"/> Temporary / Ephemeral		
Cover - % of waterbody in AA containing cover objects (e.g. submerged logs, large rocks & boulders, overhanging banks, floating-leaved vegetation)	>25%	10-25%	<10%	>25%	10-25%	<10%	>25%	10-25%	<10%
Shading - >75% of streambank or shoreline of AA contains riparian or wetland scrub-shrub or forested communities	--	--	--	--	--	--	--	--	--
Shading - 50 to 75% of streambank or shoreline of AA contains riparian or wetland scrub-shrub or forested communities.	--	--	--	--	--	--	--	--	--
Shading - < 50% of streambank or shoreline of AA contains riparian or wetland scrub-shrub or forested communities.	--	--	--	--	--	--	--	--	--

ii. **Modified Habitat Quality:** Is fish use of the AA precluded or significantly reduced by a culvert, dike, other man-made structure or activity or is the waterbody included on the 'MDEQ list of waterbodies in need of TMDL development' with 'Probable Impaired Uses' listed as cold or warm water fishery or aquatic life support?

☒ **Y** ☐ **N** If yes, reduce the rating from 14D(i) by one level and check the modified habitat quality rating: ☐ **E** ☐ **H** ☐ **M** ☒ **L**

iii. **Rating** (Use the conclusions from 14D(i) and 14D(ii) above and the matrix below to pick the functional point and rating of exceptional (E), high (H), moderate (M), or low (L).)

Types of Fish Known or Suspected Within AA	Modified Habitat Quality from 14D(ii)			
	<input type="checkbox"/> Exceptional	<input type="checkbox"/> High	<input type="checkbox"/> Moderate	<input type="checkbox"/> Low
Native game fish	--	--	--	--
Introduced game fish	--	--	--	--
Non-game fish	--	--	--	--
No fish	--	--	--	--

Comments: _____

14E. FLOOD ATTENUATION ☐ **NA** (proceed to 14G)

Applies only to wetlands subject to flooding via in-channel or overbank flow.

If wetlands in AA do not flooded from in-channel or overbank flow, check NA above.

i. **Rating** (Working from top to bottom, mark the appropriate attributes to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.)

Estimated wetland area in AA subject to periodic flooding	<input type="checkbox"/> ≥ 10 acres			<input checked="" type="checkbox"/> <10, >2 acres			<input type="checkbox"/> ≤2 acres		
% of flooded wetland classified as forested, scrub/shrub, or both	75%	25-75%	<25%	75%	25-75%	<25%	75%	25-75%	<25%
AA contains no outlet or restricted outlet	--	--	--	--	--	.5 (M)	--	--	--
AA contains unrestricted outlet	--	--	--	--	--	--	--	--	--

ii. **Are residences, businesses, or other features which may be significantly damaged by floods located within 0.5 miles downstream of the AA?** (check)

☒ **Y** ☐ **N** Comments: homes, ranches

14F. SHORT AND LONG TERM SURFACE WATER STORAGE ☐ **NA** (proceed to 14G)

Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow.

If no wetlands in the AA are subject to flooding or ponding, check NA above.

i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.)

Abbreviations: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral.

Estimated maximum acre feet of water contained in wetlands within the AA that are subject to periodic flooding or ponding.	<input type="checkbox"/> >5 acre feet			<input checked="" type="checkbox"/> <5, >1 acre feet			<input type="checkbox"/> ≤1 acre foot		
Duration of surface water at wetlands within the AA	P/P	S/I	T/E	P/P	S/I	T/E	P/P	S/I	T/E
Wetlands in AA flood or pond ≥ 5 out of 10 years	--	--	--	--	.6 (M)	--	--	--	--
Wetlands in AA flood or pond < 5 out of 10 years	--	--	--	--	--	--	--	--	--

Comments: _____

14G. SEDIMENT/NUTRIENT/TOXICANT RETENTION AND REMOVAL ☐ **NA** (proceed to 14H)

Applies to wetlands with potential to receive excess sediments, nutrients, or toxicants through influx of surface or ground water or direct input.

If no wetlands in the AA are subject to such input, check NA above.

i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.)

Sediment, Nutrient, and Toxicant Input Levels Within AA	AA receives or surrounding land use has potential to deliver low to moderate levels of sediments, nutrients, or compounds such that other functions are not substantially impaired. Minor sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.				Waterbody on MDEQ list of waterbodies in need of TMDL development for "probable causes" related to sediment, nutrients, or toxicants or AA receives or surrounding land use has potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.			
% cover of wetland vegetation in AA	<input checked="" type="checkbox"/> ≥ 70%		<input type="checkbox"/> < 70%		<input type="checkbox"/> ≥ 70%		<input type="checkbox"/> < 70%	
Evidence of flooding or ponding in AA	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
AA contains no or restricted outlet	1 (H)	--	--	--	--	--	--	--
AA contains unrestricted outlet	--	--	--	--	--	--	--	--

Comments: _____

14H. SEDIMENT/ShORELINE STABILIZATION☐ **NA** (proceed to 14I)

Applies only if AA occurs on or within the banks of a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body that is subject to wave action. If this does not apply, check NA above.

- i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating exceptional (E), high (H), moderate (M), or low (L) for this function.

% Cover of wetland streambank or shoreline by species with deep, binding rootmasses.	Duration of Surface Water Adjacent to Rooted Vegetation		
	<input checked="" type="checkbox"/> Permanent / Perennial	<input type="checkbox"/> Seasonal / Intermittent	<input type="checkbox"/> Temporary / Ephemeral
≥ 65 %	1 (H)	--	--
35-64 %	--	--	--
< 35 %	--	--	--

Comments:

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT

- i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.
A = acreage of vegetated component in the AA. **B** = structural diversity rating from #13. **C** = Yes (Y) or No (N) as to whether or not the AA contains a surface or subsurface outlet; **P/P** = permanent/perennial; **S/I** = seasonal/intermittent; **T/E/A** = temporary/ephemeral/absent.

A	<input type="checkbox"/> Vegetated component >5 acres						<input checked="" type="checkbox"/> Vegetated component 1-5 acres						<input type="checkbox"/> Vegetated component <1 acre					
B	<input type="checkbox"/> High		<input type="checkbox"/> Moderate		<input type="checkbox"/> Low		<input type="checkbox"/> High		<input type="checkbox"/> Moderate		<input checked="" type="checkbox"/> Low		<input type="checkbox"/> High		<input type="checkbox"/> Moderate		<input type="checkbox"/> Low	
C	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N
P/P	--	--	--	--	--	--	--	--	--	--	.7M	--	--	--	--	--	--	--
S/I	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
T/E/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Comments:

14J. GROUNDWATER DISCHARGE/RECHARGE (D/R) (Check the indicators in i & ii below that apply to the AA)i. ☐ **Discharge Indicators**

- ☒ Springs are known or observed.
☐ Vegetation growing during dormant season/drought.
☐ Wetland occurs at the toe of a natural slopes.
☐ Seeps are present at the wetland edge.
☐ AA permanently flooded during drought periods.
☐ Wetland contains an outlet, but no inlet.
☐ Other

ii. ☐ **Recharge Indicators**

- ☒ Permeable substrate presents without underlying impeding layer.
☐ Wetland contains inlet but not outlet.
☐ Other

- iii. **Rating:** Use the information from 14J(i) and 14J(ii) above and the table below to arrive at the functional point and rating of high (H) or low (L) for this function.

Criteria	Functional Point and Rating
AA has known Discharge/Recharge area or one or more indicators of D/R present	1 (H)
No Discharge/Recharge indicators present	--
Available Discharge/Recharge information inadequate to rate AA D/R potential	--

Comments:

14K. UNIQUENESS

- i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.

Replacement Potential	AA contains fen, bog, warm springs or mature (>80 yr-old) forested wetland or plant association listed as "S1" by the MTNHP.			AA does not contain previously cited rare types and structural diversity (#13) is high or contains plant association listed as "S2" by the MTNHP.			AA does not contain previously cited rare types or associations and structural diversity (#13) is low-moderate.		
Estimated Relative Abundance from #11	<input type="checkbox"/> rare	<input type="checkbox"/> common	<input type="checkbox"/> abundant	<input type="checkbox"/> rare	<input type="checkbox"/> common	<input type="checkbox"/> abundant	<input type="checkbox"/> rare	<input checked="" type="checkbox"/> common	<input type="checkbox"/> abundant
Low disturbance at AA (#12i)	--	--	--	--	--	--	--	.4M	--
Moderate disturbance at AA (#12i)	--	--	--	--	--	--	--	--	--
High disturbance at AA (#12i)	--	--	--	--	--	--	--	--	--

Comments: cottonwoods, alder and willows are found adjacent to the assessment area.

14L. RECREATION / EDUCATION POTENTIAL

- i. **Is the AA a known recreational or educational site?** ☐ **Yes** (Rate ☐ **High (1.0)**, then proceed to 14L(ii) only] ☒ **No** [Proceed to 14L(iii)]
ii. **Check categories that apply to the AA:** ☐ Educational / scientific study ☒ Consumptive rec. ☐ Non-consumptive rec. ☐ Other
iii. **Based on the location, diversity, size, and other site attributes, is there a strong potential for recreational or educational use?**
☒ **Yes** [Proceed to 14L (ii) and then 14L(iv).] ☐ **No** [Rate as low in 14L(iv)]

- iv. **Rating** (Use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.

Ownership	Disturbance at AA from #12(i)	
	<input checked="" type="checkbox"/> Low	<input type="checkbox"/> Moderate <input type="checkbox"/> High
Public ownership	--	--
Private ownership	.7(M)	--

Comments: _____

FUNCTION, VALUE SUMMARY, AND OVERALL RATING

Function and Value Variables	Rating	Actual Functional Points	Possible Functional Points	Functional Units (Actual Points x Estimated AA Acreage)
A. Listed/Proposed T&E Species Habitat	L	0.0	1	
B. MT Natural Heritage Program Species Habitat	L	0.10	1	
C. General Wildlife Habitat	M	0.70	1	
D. General Fish/Aquatic Habitat	NA	0.00	--	
E. Flood Attenuation	M	0.50	1	
F. Short and Long Term Surface Water Storage	M	0.60	1	
G. Sediment/Nutrient/Toxicant Removal	H	1.00	1	
H. Sediment/Shoreline Stabilization	H	1.00	1	
I. Production Export/Food Chain Support	M	0.70	1	
J. Groundwater Discharge/Recharge	H	1.00	1	
K. Uniqueness	M	0.40	1	
L. Recreation/Education Potential	M	0.70	1	
Totals:		6.70	11.00	
Percent of Total Possible Points:			61% (Actual / Possible) x 100 [rd to nearest whole #]	

Category I Wetland: (Must satisfy **one** of the following criteria. If not proceed to Category II.)

- ☐ Score of 1 functional point for Listed/Proposed Threatened or Endangered Species; **or**
☐ Score of 1 functional point for Uniqueness; **or**
☐ Score of 1 functional point for Flood Attenuation **and** answer to Question 14E(ii) is "yes"; **or**
☐ Percent of total Possible Points is > 80%.

Category II Wetland: (Criteria for Category I not satisfied **and** meets any **one** of the following Category II criteria. If not satisfied, proceed to Category IV.)

- ☐ Score of 1 functional point for Species Rated S1, S2, or S3 by the MT Natural Heritage Program; **or**
☐ Score of .9 or 1 functional point for General Wildlife Habitat; **or**
☐ Score of .9 or 1 functional point for General Fish/Aquatic Habitat; **or**
☐ "High" to "Exceptional" ratings for **both** General Wildlife Habitat **and** General Fish / Aquatic Habitat; **or**
☐ Score of .9 functional point for Uniqueness; **or**
☐ Percent of total possible points is > 65%.

☒ **Category III Wetland:** (Criteria for Categories I, II, or IV not satisfied.)

Category IV Wetland: (Criteria for Categories I or II are not satisfied **and** all of the following criteria are met; If not satisfied, proceed to Category III.)

- ☐ "Low" rating for Uniqueness; **and**
☐ "Low" rating for Production Export / Food Chain Support; **and**
☐ Percent of total possible points is < 30%.

OVERALL ANALYSIS AREA (AA) RATING: (Check appropriate category based on the criteria outlined above.)

☐ **I**
☐ **II**
☒ **III**
☐ **IV**

Appendix C

2007 REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring
Cloud Ranch
Big Timber, Montana

CLOUD RANCH WETLAND MITIGATION SITE 2007



Photograph A: Description: Transect #1 – Big Timber Creek west side. **Compass Reading:** West



Photograph B: Description: Transect #1 – Big Timber Creek bank to bank. **Compass Reading:** South



Photograph C: Description: Transect #1 – Vegetation re-establishment on point bars. **Compass Reading:** North



Photograph D: Description: Transect #1 – Big Timber Creek east side. **Compass Reading:** East



Photograph E: Description: Big Timber Creek new channel. **Compass Reading:** South



Photograph F: Description: Big Timber Creek point bar left side of channel. **Compass Reading:** North

CLOUD RANCH WETLAND MITIGATION SITE 2007



Photograph G: Description: Big Timber Creek – riverine wetland. **Compass Reading:** West



Photograph H: Description: Big Timber Creek – side bar smaller compared to 2005 photo. **Compass Reading:** East



Photograph I: Description: Big Timber Creek – riverine wetland with young trees. **Compass Reading:** Southeast



Photograph J: Description: Off-channel wetlands, two community types. **Compass Reading:** East



Photograph K: Description: Off-channel wetland - unnamed tributary. **Compass Reading:** East



Photograph L: Description: Embankment removal area note increased in woody cover. **Compass Reading:** East

CLOUD RANCH WETLAND MITIGATION SITE 2007



Photograph M: Description: Off channel wetlands and buffer around pond. **Compass Reading:** SE



Photograph N: Description: Transect #2 – off channel wetlands. **Compass Reading:** West



Photograph O: Description: Transect #2 wetlands. **Compass Reading:** Southeast



Photograph P: Description: Note significant reduction of bare soil compared to 2005. **Compass Reading:** SW



Photograph Q: Description: Expanding wetland in SE corner of the project site. **Compass Reading:** South

CLOUD RANCH WETLAND MITIGATION SITE 2007



Photograph A-1: Description: Big Timber Creek – eroding east bank on transect 1.

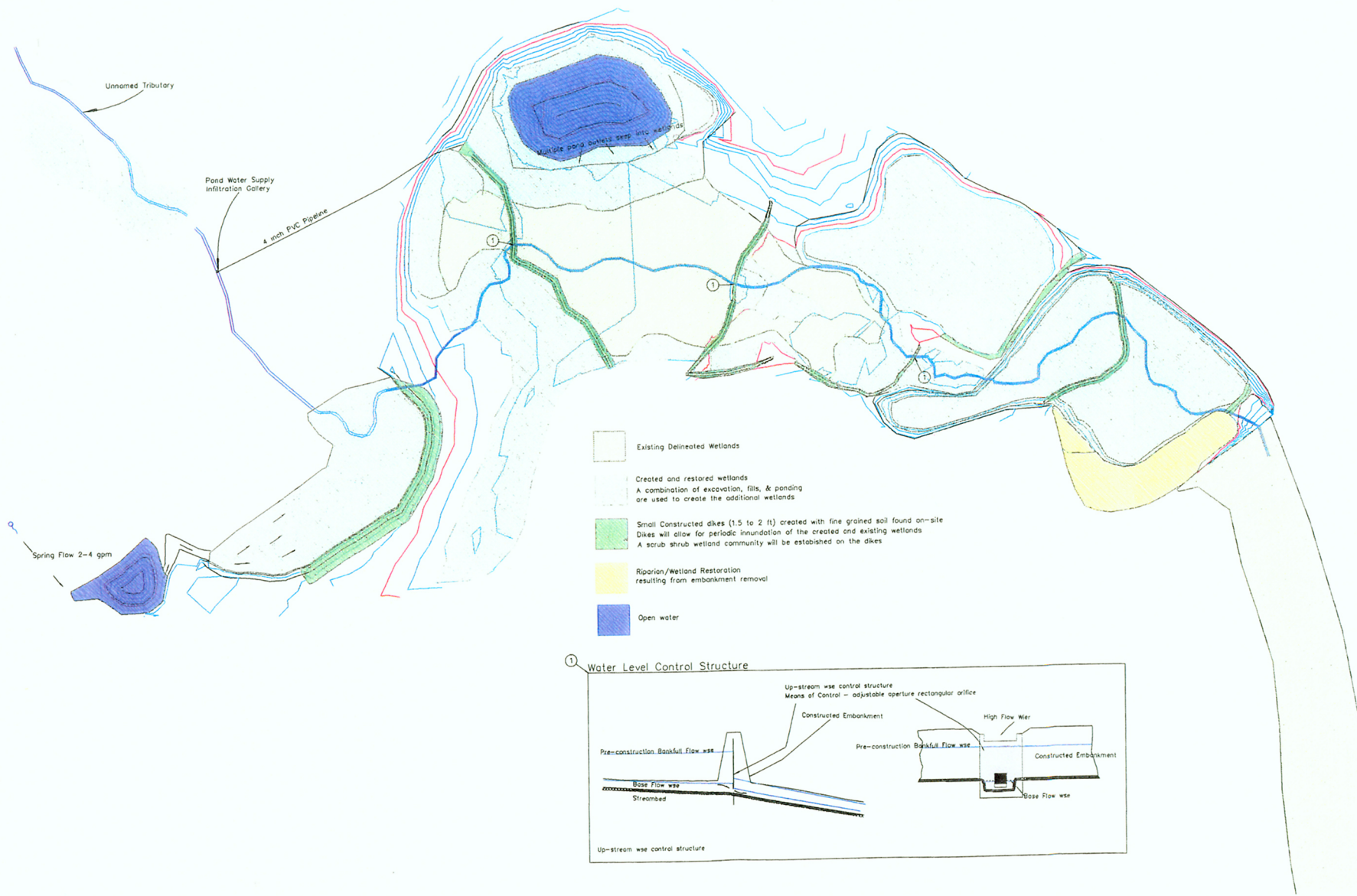


Photograph C-1: Description: Cottonwood seedlings on gravel bars.

Appendix D

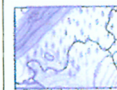
WETLAND MITIGATION SITE MAP

*MDT Wetland Mitigation Monitoring
Cloud Ranch
Big Timber, Montana*



PROJECT		Cloud Ranch	
PROJECT NO.	NEW	140	REV
Proposed Wetland Creation Site Plan		3/03	
SCALE		1" = 80'	
SHEET		1 of 1	

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Appendix E

BIRD SURVEY PROTOCOL GPS PROTOCOL

*MDT Wetland Mitigation Monitoring
Cloud Ranch
Big Timber, Montana*

BIRD SURVEY PROTOCOL

This protocol was developed by the Montana Department of Transportation (MDT) to monitor bird use within their Wetland Mitigation Sites. Though each wetland mitigation site is vastly different, the bird survey data collection methods were standardized to order to increase repeatability. The protocol uses an "area search within a restricted time frame" to collect data on bird species, density, behavior, and habitat-type use.

Survey Area

Sites that can be entirely walked: Sites where the entire perimeter or area can be walked include, but are not limited to: small ponds, enhanced historic river channels, and wet meadows. If the wetland is not uncomfortably inundated, walk several meandering transects to sufficiently cover the wetland. Meandering transects can be used, even if a small portion of the area is inaccessible (e.g. cannot cross due to inundation). Use binoculars to identify the bird species, to count the number of individuals, and to identify their behavior and habitat type. Data can be recorded directly onto the bird survey form or into a field notebook. The number of meandering transects and their direction (or location) should be recorded in the field notebook and/or drawn onto the aerial photograph or topographic map. Meandering transects are not formal and should not be staked. Each site should be walked and surveyed to the fullest extent within the set time limit.

Sites than cannot be entirely walked: Sites where the entire perimeter or area cannot be walked include, but are not limited to: very large sites (i.e. perimeter of 2-3 miles), and large-bodied waters (i.e. reservoirs), where deep water habitat (> 6 feet) is close to shore. For large-bodied waters where only one area was graded to create or enhance the development of wetland, bird surveys should be walked along meandering transects within or around the graded area (see above.). For sites that cannot be walked, bird surveys should be conducted from many lookout posts, established at key vantage points. The general location of lookout posts should be recorded in the field notebook or drawn onto the aerial photograph or topographic map. Lookout post locations do not need to be staked. Both binoculars and spotting scopes may be used in order to accurately identify and count the birds. Depending upon the size of the open water, more time may be spent viewing the mitigation area from lookout posts than is spent traveling between posts.

Survey Time

Ideally, bird surveys should be conducted in the morning hours when bird activity is often greatest (i.e. sunrise to no later than 11:00 am). Surveys can be completed before 11am if all transects have been walked or all lookout posts have been viewed with no new bird activity observed. For some sites bird surveys may need to be performed in the late afternoon or evening due to traveling constraints or weather. The overall limiting time factor will be the number of budgeted hours for the project.

Data Recording

Bird Species List: Record each bird species observed onto the Bird Survey-Field Data Sheet (or field notebook). Record the bird's common name using the appropriate 4-letter code. The 4-letter code uses the first two letters of the first two word's of the bird's common name or if one name, the first four letters. For example, Mourning Dove is coded as MODO while Mallard is coded as MALL. If an unknown individual is observed, use the 4-letter protocol, but define your

BIRD SURVEY PROTOCOL (continued)

abbreviation at the bottom of the field data sheet. For example, unknown shorebird is UNSB; unknown brown bird is UNBR; unknown warbler is UNWA; and unknown waterfowl is UNWF. For a flyover of a flock of unknown species, use a term that describes the birds' general characteristics and include the approximate flock size in parenthesis; do not fill in the habitat column. For example, a flock of black, medium-sized birds could be coded as UNBB / FO (25).

Bird Density: For each observation record the actual or estimated number of individuals observed per species and per behavior. Totals can be tallied in the office and entered onto the Bird Survey-Field Data Sheet.

Bird Behavior: Bird behavior must be identified by what is known. When a species is observed, the behavior that is immediately exhibited is recorded. Only behaviors that have discreet descriptive terms should be used. The following terms are recommended: breeding pair (BP); foraging (F); flyover (FO); loafing (L), which is defined as sleeping, roosting, or floating with head tucked under wing; and nesting (N). If other behaviors that have a specific descriptive word are observed then it can be used and should later be added to the protocol. Descriptive words or phrases such as "migrating" or "living on site" are unknown behaviors.

Bird Species Habitat Use: When a species is observed, the habitat is also recorded. The following broad habitat categories are used:

- ◆ aquatic bed (AB), defined as rooted-floating, floating-leaved, or submergent vegetation.
- ◆ marsh (MA), defined as emergent (e.g. cattail, bulrush) vegetation with surface water.
- ◆ wet meadow (WM), defined as grasses, sedges, or rushes with little to no surface water.
- ◆ scrub-shrub (SS), defined as shrub covered wetland.
- ◆ forested (FO), defined as tree covered wetland.
- ◆ open water (OW), defined as unvegetated surface water.
- ◆ upland (UP), defined as the upland buffer.

Other categories can be used and defined on the data sheet and should later be added to the protocol.

Other Fields

Bird Visit: Each bird survey (i.e. spring, fall, and mid-season) should be completed on separate Bird Survey-Field Data Sheets.

Time: Record the start time and end time on the Bird Survey-Field Data Sheet.

Date: Record the date of the bird survey.

Weather: Record the weather conditions (i.e. temperature, wind, condition).

Notes: Note if a particular individual bird is using a constructed nest box and note the condition of constructed nest box(es). Also record any comments about the site, wildlife, wetland conditions, etc.

GPS MAPPING AND AERIAL PHOTO REFERENCING PROCEDURE

From 2001 through 2006, PBS&J mapped the vegetation community boundaries, photograph points, and other sampling locations in the field using the resource-grade Trimble GEO III GPS (Global Positioning System) unit. The data were collected with a minimum of three positions per feature using Course/Acquisition code. The collected data were then transferred to a personal computer (PC) and differentially corrected to the nearest operating Community Base Station. The corrected data were then exported to ACAD drawings in Montana State Plain Coordinates NAD 83 international feet.

The collected and processed Trimble Geo III GPS positions had a 68% accuracy of 7 feet except in isolated areas where accuracy fell to 12 feet. This is within the 1 to 5 meter range listed as the expected accuracy of the mapping grade Trimble GPS.

In 2007, some sites continued to be mapped using the Trimble GEO III GPS unit while most sites were mapped using the resource-grade Magellan MobileMapper Office GPS unit. The Magellan GPS unit has a comparable accuracy level to the Trimble Geo III unit.

Each year, MDT photographs each mitigation site from the air. These aerial photographs are not geo-referenced, but serve as a visual aid to map wetland development and vegetation communities, and to show approximate locations for various monitoring activities (i.e. photograph points, transects, or macroinvertebrate sampling). Reference points that are observable on the aerial photo (i.e. road, stream channel, or fence) were also marked with the GPS unit in order to better position the aerial photograph. This positioning did not remove any of the distortion inherent to all photos. All mapped features and community boundaries were reviewed by the wetland biologist, to increase the figure's accuracy.

Any relationship of features located to easement or property lines are not to be construed from these figures. These relationships can only be determined with a survey by a licensed surveyor.

Appendix F

2007 MACROINVERTEBRATE SAMPLING PROTOCOL AND DATA

*MDT Wetland Mitigation Monitoring
Cloud Ranch
Big Timber, Montana*

AQUATIC INVERTEBRATE SAMPLING PROTOCOL

Equipment List

- D-frame sampling net with 1 mm mesh.
- 1-liter, wide-mouth, plastic sample jars provided by Rhithron Associates, Inc. (Quart sized, wide-mouthed canning jars can be substituted.)
- 95% ethanol (alternatively isopropyl alcohol).
- Pre-printed sample labels (printed on rite-in-the-rain paper); two labels per sample.
- Pencil.
- Clear packaging tape.
- 3-5 gallon plastic pail.
- Large tea strainer or framed screen.
- Cooler with ice for storing sample.

Site Selection

Select a site that is accessible with hip waders or rubber boots. If the substrate is too soft, place a wide board down to walk on. Choose a site that is representative of the overall condition of the wetland. Annual sampling should occur at the same site within the wetland.

Sampling Procedure

Wetland invertebrates (macroinvertebrates) inhabit the substrate, the water column, the stems and leaves of aquatic vegetation, and the water surface. At the given location, each habitat type is sampled and combined into a single 1-liter sample jar. Pre-cautions are made to minimize disturbing the sample site in order to maximize the number of animals collected.

Fill the pail with approximately 1 gallon of wetland water. Ideally, sample the water column from near-shore outward to a depth of 3 feet. Sample the water column using a long sweep of the net, keeping the net at about half the depth of the water. Sample the water surface with a long sweep of the net. Aquatic vegetation is sampled by pulling the net beneath the water surface, for at least a meter in distance. The substrate is sampled by pulling the net along the bottom, bumping it against the substrate several times as you pull. Be sure to place some muck, mud, and/or vegetation into the jar. After sampling a habitat, rinse the net in the bucket and look for insects, crustaceans, and other aquatic invertebrates. It is not necessary to sample habitats in any specific order, but all habitats, if present, are to be sampled. Habitats can be sampled more than once.

Fill about 1 cup of ethanol into the sample jar. Sieve the contents of the bucket through the straining device and pour or carefully scrape the contents of the strainer into the sample jar. Top off the jar with enough ethanol to cover all the material and leave as little headroom as possible. Alternatively, sampled materials can be lifted out of the net and put directly into the jar. Be sure to include some muck, mud, and/or vegetation into the jar. Each macroinvertebrate sampling site should have only one sampling jar.

Using pencil, complete two labels with the required information: project name, project number, date, collector's name, and habitats sampled. Do not complete the label with ink as it will dissolve in ethanol. For wetlands with at least two macroinvertebrate sampling sites, number the site consecutively followed by the total number of sites (e.g. Sample 2 of 3 sites). Place one label into the jar and seal the jar. Dry the jar off, if necessary, and tape the second label to the outside of the jar.

Photograph each macroinvertebrate sampling site.

Sample Handling/Delivery

In the field, keep sample jars cool by placing in a cooler with a small amount of ice.

Deliver samples to the PBS&J office in Missoula, where they will be inventoried and delivered to Rhithron Associates, Inc.

**MDT Mitigated Wetland Monitoring Project: Aquatic Invertebrate Monitoring
Summary 2001 – 2007**

Prepared for Post, Buckley, Schuh, and Jernigan (PBS&J)

Prepared by W.Bollman, Rhithron Associates, Inc.

INTRODUCTION

Aquatic invertebrate assemblages were collected at a number of mitigated wetlands throughout Montana. This report summarizes data generated from seven years of collection. Over all years of sampling, a total of 182 invertebrate samples were collected. Table 1 lists the currently monitored sites at which aquatic invertebrates were collected in 2007, and summarizes the sampling history of each.

METHODS

Sample processing

Aquatic invertebrate samples were collected at mitigated wetland sites in the summer months of 2001, 2002, 2003, 2004, 2005, 2006 and 2007 by personnel of PBS&J. Sampling procedures utilized were based on the protocols developed by the Montana Department of Environmental Quality (MT DEQ) for wetland sampling. Sampling consisted of D-frame net sweeps through emergent vegetation (when present), the water column, and over the water surface, and included disturbing and scraping substrates at each sampled site. These sample components were composited and preserved in ethanol at each wetland site. Samples were delivered to Rhithron Associates, Inc. for processing, taxonomic determinations, and data analysis.

Standard sorting protocols were applied to achieve representative subsamples of a minimum of 100 organisms. Caton sub-sampling devices (Caton 1991), divided into 30 grids, each approximately 5 cm by 6 cm, were used. Grid contents were examined under stereoscopic microscopes using 10x-30x magnification. All aquatic invertebrates from each selected grid were sorted from the substrate, and placed in 95% ethanol for subsequent identification. Grid selection, examination, and sorting continued until at least 100 organisms were sorted. A large/rare search was conducted to collect any taxa not found in the subsampling procedure.

Organisms were individually examined using 10x – 80x stereoscopic dissecting scopes (Leica S8E and S6E) and identified to the lowest practical taxonomic levels using appropriate published taxonomic references. Identification, counts, life stages, and information about the condition of specimens were recorded on bench sheets. To obtain accuracy in richness measures, organisms that could not be identified to the target level specified in MDEQ protocols were designated as “not unique” if other specimens from the same group could be taken to target levels. Organisms designated as “unique” were those that could be definitively distinguished from other organisms in the sample. Identified organisms were preserved in 95% ethanol in labeled vials, and archived at the Rhithron laboratory. Midges were morphotyped using 10x – 80x stereoscopic dissecting microscopes (Leica S8E and S6E) and representative specimens were slide mounted and examined at 200x – 1000x magnification using an Olympus BX 51 compound microscope. Slide mounted organisms were also archived at the Rhithron laboratory.

Quality assurance systems

Quality control procedures for initial sample processing and subsampling involved checking sorting efficiency. These checks were conducted on 96% of the samples by independent observers who microscopically re-examined 20% of sorted substrate from each sample. All organisms that were missed were counted and this number was added to the total number obtained in the original sort. Sorting efficiency was evaluated by applying the following calculation:

$$SE = \frac{n_1}{n_{1+2}} \times 100$$

where: SE is the sorting efficiency, expressed as a percentage, n_1 is the total number of specimens in the first sort, and n_{1+2} is the total number of specimens in the first and second sorts combined.

Quality control procedures for taxonomic determinations of invertebrates involved checking accuracy, precision and enumeration. At least 10% of samples are targeted for quality assurance procedures. For this project, three samples were randomly selected and all organisms re-identified and counted by an independent taxonomist. Taxa lists and enumerations were compared by calculating a Bray-Curtis similarity statistic (Bray and Curtis 1957) for each

selected sample. Routinely, discrepancies between the original identifications and the QC identifications are discussed among the taxonomists, and necessary rectifications to the data are made. Discrepancies that cannot be rectified by discussions are routinely sent out to taxonomic specialists for identification. However, taxonomic certainty for identifications in this project was high, and no external verifications were necessary.

Assessment

The method employed to assess these wetlands is based on an index incorporating a battery of 12 bioassessment metrics or attributes (Table 1) tested and recommended by Stribling et al. (1995) in a report to the Montana Department of Health and Environmental Science. In that study, it was determined that some of the metrics were of limited use in some geographic regions, and for some wetland types. Despite that finding, all 12 metrics are used in this evaluation of mitigated wetlands, since detailed geographic information and wetland classifications were unavailable. Scoring criteria for the 12 metrics were developed specifically for this project, since mitigated wetlands were not included in original criteria development.

Scoring criteria for wetland metrics were developed by generally following the tactic used by Stribling et al. (1995). Boxplots were generated using a statistical software package (Statistica™), and distributions, median values, ranges, and quartiles for each metric were examined. For the wetland sites, “optimal” scores were generally those that fell above the 75th percentile (for those metrics that decrease in value in response to stress) or below the 25th percentile (for metrics that respond to stress by an increase in value) of all scores. Additional scoring ranges were established by bisecting the range below the 75th percentile for decreasing scores (or above the 25th percentile for increasing scores) into “sub-optimal” and “poor” assessment categories. A score of 5, 3, or 1 was assigned to optimal, sub-optimal, and poor metric performance, respectively. In this way, metric values were translated into normalized metric scores, and scores for all metrics were summed to produce a total bioassessment score, which is expressed as a percentage of the maximum possible score (60). Total bioassessment scores were classified according to a similar process, using the ranges and distributions of total scores for all sites studied in all years. Data from a total of 167 samples were used to develop criteria.

Several sites in this study supported aquatic fauna characteristic of lotic habitats rather than lentic wetland habitats; these sites were excluded from mitigated wetland scoring criteria development, and were evaluated with a metric battery specific to flowing water habitats. In 2007, the lotic sites were Camp Creek (2 sites), Cloud Ranch stream, Kleinschmidt stream, Jack Creek, and Woodson Creek-Ringling stream. Invertebrate assemblages at these sites were generally characteristic of montane or foothill stream conditions and were assessed using the tested metric battery developed for montane streams of Western Montana (Bollman 1998).

The purpose of constructing an index from biological attributes or metrics is to provide a means of integrating information to facilitate the determination of whether management action is needed. However, the nature of the action needed is not determined solely by the index score or impairment classification, but by consideration of an analysis of the component metrics, the taxonomic composition of the assemblages, and other issues. The diagnostic functions of the metrics and taxonomic data need more study since our understanding of the interrelationships of natural environmental factors and anthropogenic disturbances is tentative. Thus, the further interpretive remarks accompanying the raw taxonomic and metric data in this summary are offered cautiously. Year-to-year comparisons depend on an assumption that specific sites were revisited in each year, and that equivalent sampling methods were utilized at each site revisit.

Bioassessment metrics - wetlands

An index based on the performance of 12 metrics was constructed, as described above. Table 2 lists those metrics, describes their calculation and the expected response of each to increased degradation or impairment of the wetland.

In addition to the summed scores of each metric and the associated impairment classification described above, each individual metric informs the bioassessment to some degree. The four richness metrics (Total taxa, POET, Chironomidae taxa, and Crustacea taxa + Mollusca taxa) can be interpreted to express habitat complexity as well as water quality. Complex, diverse habitats consist of variable substrates, emergent vegetation, variable water depths and other factors, and are potential features of long-established stable wetlands with minimal human disturbance. In the study conducted by Stribling et al. (1995), all four richness metrics were found to be significantly associated with water quality parameters including conductance, salinity, and total dissolved solids.

Four composition metrics (%Chironomidae, %Orthocladiinae of Chironomidae, %Crustacea + %Mollusca, and %Amphipoda) measure the relative contributions of certain taxonomic groups that may have significant responses to habitat and/or water quality impacts. For example, amphipods have been demonstrated to increase in abundance in

alkaline conditions. Short-lived, relatively mobile taxa such as chironomids dominate ephemeral environments; many are hemoglobin-bearers capable of tolerating de-oxygenated conditions.

Two tolerance metrics (the Hilsenhoff Biotic Index and %Dominant taxon) were included in the bioassessment battery. The HBI indicates the overall invertebrate assemblage tolerance to nutrient enrichment, warm water, and/or low dissolved oxygen conditions. The percent abundance of the dominant taxon has been demonstrated to be strongly associated with pH, conductance, salinity, total organic carbon, and total dissolved solids.

Two trophic measures (%Collector-gatherers and %Filterers) may be helpful in expressing functional integrity of the invertebrate assemblage, which can be impacted by poor water quality or habitat degradation. High proportions of filtering organisms suggest nutrient and/or organic enrichment, while abundant collectors suggest more positive functional conditions and well-developed wetland morphology. These organisms graze periphyton growing on stable surfaces such as macrophytes.

Summary metric values and scores for the 2007 samples are given in Tables 4a-4c and 5.

In 2007, thermal preference of the invertebrate assemblages was calculated when possible, using the tool developed by Brandt 2001.

Bioassessment metrics – lotic habitats

For sites supporting rheophilic invertebrate assemblages, bioassessment was based on a metric battery and scoring criteria developed for montane regions of Montana (MVFP index: Bollman 1998). The six metrics constituting the bioassessment index used for MVFP sites in this study were selected because, both individually and as an integrated metric battery, they are robust at distinguishing impaired sites from relatively unimpaired sites (Bollman 1998). They have been demonstrated to be more variable with anthropogenic disturbance than with natural environmental gradients (Bollman 1998). Each of the six metrics, and their expected responses to various stressors is described below.

1. Ephemeroptera (mayfly) taxa richness. The number of mayfly taxa declines as water quality diminishes. Impairments to water quality which have been demonstrated to adversely affect the ability of mayflies to flourish include elevated water temperatures, heavy metal contamination, increased turbidity, low or high pH, elevated specific conductance and toxic chemicals. Few mayfly species are able to tolerate certain disturbances to instream habitat, such as excessive sediment deposition.
2. Plecoptera (stonefly) taxa richness. Stoneflies are particularly susceptible to impairments that affect a stream on a reach-level scale, such as loss of riparian canopy, streambank instability, channelization, and alteration of morphological features such as pool frequency and function, riffle development and sinuosity. Just as all benthic organisms, they are also susceptible to smaller scale habitat loss, such as by sediment deposition, loss of interstitial spaces between substrate particles, or unstable substrate.
3. Trichoptera (caddisfly) taxa richness. Caddisfly taxa richness has been shown to decline when sediment deposition affects habitat. In addition, the presence of certain case-building caddisflies can indicate good retention of woody debris and lack of scouring flow conditions.
4. Number of sensitive taxa. Sensitive taxa are generally the first to disappear as anthropogenic disturbances increase. The list of sensitive taxa used here includes organisms sensitive to a wide range of disturbances, including warmer water temperatures, organic or nutrient pollution, toxic pollution, sediment deposition, substrate instability and others. Unimpaired streams of western Montana typically support at least four sensitive taxa (Bollman 1998).
5. Percent filter feeders. Filter-feeding organisms are a diverse group; they capture small particles of organic matter, or organically enriched sediment material, from the water column by means of a variety of adaptations, such as silken nets or hairy appendages. In forested montane streams, filterers are expected to occur in insignificant numbers. Their abundance increases when canopy cover is lost and when water temperatures increase and the accompanying growth of filamentous algae occurs. Some filtering organisms, specifically the Arctopsychid caddisflies (*Arctopsyche* spp. and *Parapsyche* spp.) build silken nets with large mesh sizes that capture small organisms such as chironomids and early-instar mayflies. Here they are considered predators, and, in this study, their abundance does not contribute to the percent filter feeders metric.
6. Percent tolerant taxa. Tolerant taxa are ubiquitous in stream sites, but when disturbance increases, their abundance increases proportionately. The list of taxa used here includes organisms tolerant of a wide range of disturbances, including warmer water temperatures, organic or nutrient pollution, toxic pollution, sediment deposition, substrate instability and others.

Table 1. Montana Department of Transportation Mitigated Wetlands Monitoring Project sites: sampling history. Only those sites monitored in 2007 are included. An asterisk (*) indicates lotic sites.

Site Identifier	2001	2002	2003	2004	2005	2006	2007
Roundup	+	+	+	+	+	+	+
Ridgeway	+	+	+	+	+	+	+
Hoskins Landing MS-1		+	+	+	+		+
Hoskins Landing MS-2							+
Peterson Ranch pond 1		+	+	+	+	+	+
Peterson Ranch pond 2		+		+	+	+	+
Peterson Ranch pond 4		+	+	+	+	+	+
Peterson Ranch pond 5		+	+	+	+	+	+
Camp Creek MS-1*		+	+	+	+	+	+
Camp Creek MS-2*						+	+
Kleinschmidt		+	+	+	+	+	+
Kleinschmidt – stream*			+	+	+	+	+
Cloud Ranch Pond				+	+		+
Cloud Ranch Stream*				+			+
Jack Creek – pond				+	+		+
Jack Creek – McKee*							+
Norem				+	+	+	+
Rock Creek Ranch					+	+	+
Wagner Marsh					+	+	+
Alkali Lake 1						+	+
Charley Creek							+
Woodson pond MI 1							+
Woodson stream MI 2*							+
Little Muddy Creek							+
Selkirk Ranch							+
DH Ranch							+

Table 2. Aquatic invertebrate metrics employed for wetland (lentic) invertebrate assemblages in the MDT mitigated wetlands study, 2001 – 2007.

Metric	Metric calculation	Expected response to degradation or impairment
Total taxa	Count of unique taxa identified to lowest recommended taxonomic level	Decrease
POET	Count of unique Plecoptera, Trichoptera, Ephemeroptera, and Odonata taxa identified to lowest recommended taxonomic level	Decrease
Chironomidae taxa	Count of unique midge taxa identified to lowest recommended taxonomic level	Decrease
Crustacea taxa + Mollusca taxa	Count of unique Crustacea taxa and Mollusca taxa identified to lowest recommended taxonomic level	Decrease
% Chironomidae	Percent abundance of midges in the subsample	Increase
Orthocladiinae / Chironomidae	Number of individual midges in the sub-family Orthocladiinae / total number of midges in the subsample.	Decrease
% Amphipoda	Percent abundance of amphipods in the subsample	Increase
% Crustacea + % Mollusca	Percent abundance of crustaceans in the subsample plus percent abundance of molluscs in the subsample	Increase
HBI	Relative abundance of each taxon multiplied by that taxon's modified Hilsenhoff Biotic Index (tolerance) value. These numbers are summed over all taxa in the subsample.	Increase
% Dominant taxon	Percent abundance of the most abundant taxon in the subsample	Increase
% Collector-Gatherers	Percent abundance of organisms in the collector-gatherer functional group	Decrease
% Filterers	Percent abundance of organisms in the filterer functional group	Increase

RESULTS

(Note: Individual site discussions were removed from this report by PBS&J and are included in the macroinvertebrate section of individual project monitoring reports. Summary tables for lentic (4a – 4c) and lotic (5) sites and project specific taxa listings and metrics reports are provided on the following pages.)

Quality Assurance

Table 3 gives the results of quality assurance procedures for sample sorting efficiency (SE) and Bray-Curtis similarity statistics for comparisons of taxonomic determinations and enumeration. Sorting efficiency averaged 97.54% for the project, and taxonomic similarity averaged 97.44%.

Table 3. Results of quality control procedures for subsampling and taxonomic and enumeration similarity.

Site name	SE	Bray-Curtis similarity
Roundup	100.00%	
Ridgeway	100.00%	
Hoskins Landing MS-1	100.00%	
Hoskins Landing MS-2	93.40%	
Peterson Ranch pond 1	100.0%	95.38%
Peterson Ranch pond 2	96.64%	
Peterson Ranch pond 4	91.66%	
Peterson Ranch pond 5	96.64%	
Camp Creek MS-1	100.00%	
Camp Creek MS-2	100.00%	96.94%
Kleinschmidt – pond	100.00%	
Kleinschmidt – stream	99.10%	
Cloud Ranch Pond	95.65%	
Cloud Ranch Stream	91.61%	
Jack Creek – pond	n.a.	
Jack Creek - McKee	96.49%	
Norem	100.00%	100.00%
Rock Creek Ranch	100.00%	
Wagner Marsh	100.00%	
Alkali Lake 1	98.04%	
Charley Creek	100.00%	
Woodson pond	91.37%	
Woodson stream	100.00%	
Little Muddy Creek	92.31%	
Selkirk Ranch	95.56%	
DH Ranch	100.00%	

Table 4a. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2007 sampling.

	ROUNDUP	RIDGEWAY	HOSKINS LANDING MS-1	HOSKINS LANDING MS-2	PETERSON RANCH 1	PETERSON RANCH 2	PETERSON RANCH 4	PETERSON RANCH 5
Total taxa	7	13	18	21	17	18	26	18
POET	0	2	3	5	2	0	6	4
Chironomidae taxa	5	5	2	8	8	12	12	6
Crustacea + Mollusca	1	2	5	4	4	5	4	4
% Chironomidae	7.62%	30.00%	18.75%	52.68%	36.45%	51.79%	42.59%	14.78%
Orthoclaadiinae/Chir	0.38	0.17	0.00	0.03	0.08	0.16	0.09	0.12
% Amphipoda	0.00%	10.00%	0.00%	0.00%	0.93%	0.00%	21.30%	1.74%
% Crustacea + % Mollusca	89.52%	15.00%	26.79%	8.04%	10.28%	43.75%	28.70%	37.39%
HBI	8.02	7.11	7.23	6.55	7.42	7.76	6.53	7.23
% Dominant taxon	89.52%	30.00%	17.86%	35.71%	39.25%	23.21%	17.59%	30.43%
% Collector-Gatherers	92.38%	70.00%	78.57%	82.14%	49.53%	71.43%	38.89%	26.96%
% Filterers	0.00%	0.00%	0.89%	6.25%	9.35%	3.57%	1.85%	5.22%
Total taxa	1	1	3	5	3	3	5	3
POET	1	1	3	5	1	1	5	5
Chironomidae taxa	3	3	1	5	5	5	3	3
Crustacea + Mollusca	1	1	3	3	3	3	1	3
% Chironomidae	5	3	3	1	3	1	1	5
Orthoclaadiinae/Chir	3	1	1	1	1	1	3	1
% Amphipoda	5	3	5	5	5	5	5	5
% Crustacea + % Mollusca	1	5	5	5	5	3	5	3
HBI	1	3	3	5	3	1	5	3
% Dominant taxon	1	5	5	3	3	5	1	5
% Collector-Gatherers	5	3	3	5	3	3	3	1
% Filterers	3	3	3	1	1	3	5	3
Total score	30	32	38	44	36	34	42	40
Percent of maximum score	50.00%	53.33%	63.33%	73.33%	60.00%	56.67%	70.00%	66.67%
Impairment classification	poor	sub-optimal	optimal	optimal	sub-optimal	sub-optimal	optimal	optimal

Table 4b. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2007 sampling.

	KLEIN-SCHMIDT POND	CLOUD RANCH POND	JACK CREEK POND	NOREM	ROCK CREEK RANCH	WAGNER MARSH	ALKALI LAKE 1	CHARLEY CREEK
Total taxa	25	13	9	6	18	11	9	13
POET	5	2	0	1	2	2	0	0
Chironomidae taxa	8	11	5	2	4	4	2	3
Crustacea + Mollusca	8	1	4	1	4	0	2	3
% Chironomidae	18.63%	81.54%	92.79%	31.58%	4.76%	11.39%	1.96%	27.17%
Orthoclaadiinae/Chir	0.53	0.38	0.03	0.00	0.60	0.44	0.50	0.68
% Amphipoda	10.78%	3.08%	0.00%	0.00%	17.14%	0.00%	0.00%	22.83%
% Crustacea + % Mollusca	36.27%	3.08%	7.21%	21.05%	23.81%	0.00%	61.76%	53.26%
HBI	7.35	7.22	9.73	6.63	6.33	7.28	8.07	6.88
% Dominant taxon	13.73%	18.46%	62.16%	26.32%	29.52%	45.57%	60.78%	29.35%
% Collector-Gatherers	53.92%	84.62%	70.27%	57.89%	29.52%	15.19%	70.59%	32.61%
% Filterers	11.76%	9.23%	0.90%	0.00%	0.95%	0.00%	0.00%	0.00%
Total taxa	5	1	1	1	3	1	1	1
POET	5	1	1	1	1	1	1	1
Chironomidae taxa	5	5	3	1	3	3	1	3
Crustacea + Mollusca	5	1	3	1	3	1	1	1
% Chironomidae	3	1	1	3	5	5	5	3
Orthoclaadiinae/Chir	5	3	1	1	5	3	5	5
% Amphipoda	3	5	5	5	3	5	5	3
% Crustacea + % Mollusca	3	5	5	5	5	5	3	3
HBI	3	3	1	5	5	3	1	5
% Dominant taxon	5	5	1	5	5	3	1	5
% Collector-Gatherers	3	5	3	3	1	1	3	1
% Filterers	1	1	3	3	3	3	3	3
Total score	46	36	28	34	42	34	30	34
Percent of maximum score	76.67%	60.00%	46.67%	56.67%	70.00%	56.67%	50.00%	56.67%
Impairment classification	optimal	sub-optimal	poor	sub-optimal	poor	sub-optimal	poor	sub-optimal

Table 4c. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2007 sampling.

	WOODSON POND	LITTLE MUDDY CREEK	SELKIRK RANCH	DH RANCH
Total taxa	12	2	16	8
POET	0	0	2	1
Chironomidae taxa	9	0	8	4
Crustacea + Mollusca	1	1	2	2
% Chironomidae	85.71%	0.00%	77.27%	27.50%
Orthocladiinae/Chir	0.32	0.00	0.61	0.00
% Amphipoda	0.00%	0.00%	0.00%	0.00%
% Crustacea + % Mollusca	2.86%	75.00%	8.18%	64.17%
HBI	9.34	8.50	7.82	7.38
% Dominant taxon	33.33%	75.00%	46.36%	39.17%
% Collector-Gatherers	55.24%	75.00%	32.73%	27.50%
% Filterers	0.00%	0.00%	8.18%	17.50%
Total taxa	1	1	3	1
POET	1	1	1	1
Chironomidae taxa	5	1	5	3
Crustacea + Mollusca	1	1	1	1
% Chironomidae	1	5	1	3
Orthocladiinae/Chir	3	1	5	1
% Amphipoda	5	5	5	5
% Crustacea + % Mollusca	5	1	5	1
HBI	1	1	1	3
% Dominant taxon	5	1	3	3
% Collector-Gatherers	3	3	1	1
% Filterers	3	3	1	1
Total score	34	24	32	24
Percent of maximum score	56.67%	40.00%	53.33%	40.00%
Impairment classification	sub-optimal	poor	sub-optimal	poor

Table 5. Metric values and scores for stream (lotic) sites in the MDT mitigated wetland study – 2007 sampling.

	CAMP CREEK MS-1	CAMP CREEK MS-2	KLEIN- SCHMIDT STREAM	CLOUD RANCH STREAM	JACK CREEK - MCKEE	WOODSON STREAM
E Richness	6	6	0	2	1	1
P Richness	0	0	0	2	0	0
T Richness	4	6	2	4	4	0
Pollution Sensitive Richness	3	4	0	1	0	0
Filterer Percent	4.85%	5.56%	7.14%	3.57%	2.83%	16.67%
Pollution Tolerant Percent	32.04%	34.26%	9.82%	14.29%	58.49%	8.33%
E Richness	3	3	0	1	0	0
P Richness	0	0	0	2	0	0
T Richness	2	3	1	2	2	0
Pollution Sensitive Richness	2	3	0	1	0	0
Filterer Percent	3	2	2	3	3	1
Pollution Tolerant Percent	1	1	2	1	0	2
Total score	11	12	5	10	5	3
Percent of maximum score	61.11%	66.67%	27.78%	55.56%	27.78%	16.67%
Impairment classification	slight	slight	moderate	slight	moderate	severe

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- Caton, L. W. 1991. Improving subsampling methods for the EPA's "Rapid Bioassessment" benthic protocols. Bulletin of the North American Benthological Society. 8(3): 317-319.
- Stribling, J.B., J. Lathrop-Davis, M.T. Barbour, J.S. White, and E.W. Leppo. 1995. Evaluation of environmental indicators for the wetlands of Montana: the multimetric approach using benthic macroinvertebrates. Report to the Montana Department of Health and Environmental Science. Helena, Montana.

Taxa Listing

Project ID: MDT07PBSJ
RAI No.: MDT07PBSJ004

RAI No.: MDT07PBSJ004

Sta. Name: Cloud Ranch Pond

Client ID:

Date Coll.: 7/24/2007

No. Jars: 1

STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Hyalellidae							
<i>Hyalella</i> sp.	2	3.08%	Yes	Unknown		8	CG
Ephemeroptera							
Baetidae							
<i>Callibaetis</i> sp.	1	1.54%	Yes	Larva		9	CG
Plecoptera							
Perlodidae							
Perlodidae	1	1.54%	Yes	Larva	Early Instar	2	PR
Diptera							
Ceratopogonidae							
Ceratopogoninae	8	12.31%	Yes	Larva		6	PR
Chironomidae							
Chironomidae							
<i>Acricotopus</i> sp.	12	18.46%	Yes	Larva		10	CG
<i>Apedilum</i> sp.	1	1.54%	Yes	Larva		11	CG
Chironomidae	2	3.08%	No	Pupa		10	CG
<i>Dicrotendipes</i> sp.	9	13.85%	Yes	Larva		8	CG
<i>Nanocladius</i> sp.	1	1.54%	Yes	Larva		3	CG
Orthocladiinae	7	10.77%	No	Larva	Early Instar	6	CG
<i>Paramerina</i> sp.	1	1.54%	Yes	Larva		6	PR
<i>Paratanytarsus</i> sp.	9	13.85%	Yes	Larva		6	CG
<i>Psectrocladius</i> sp.	3	4.62%	Yes	Larva		8	CG
<i>Pseudochironomus</i> sp.	2	3.08%	Yes	Larva		5	CG
<i>Tanytarsus</i> sp.	6	9.23%	Yes	Larva		6	CF
Sample Count	65						

Metrics Report

Project ID: MDT07PBSJ
RAI No.: MDT07PBSJ004
Sta. Name: Cloud Ranch Pond
Client ID:
STORET ID:
Coll. Date: 7/24/2007

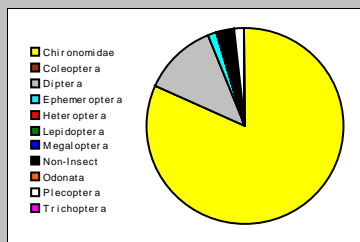
Abundance Measures

Sample Count: 65
Sample Abundance: 65.00 100.00% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	1	2	3.08%
Odonata			
Ephemeroptera	1	1	1.54%
Plecoptera	1	1	1.54%
Heteroptera			
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera			
Diptera	1	8	12.31%
Chironomidae	9	53	81.54%

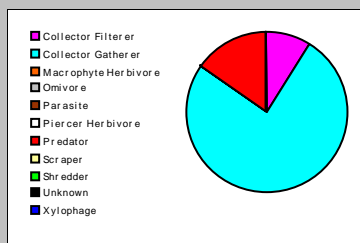


Dominant Taxa

Category	A	PRA
Acricotopus	12	18.46%
Paratanytarsus	9	13.85%
Dicrotendipes	9	13.85%
Ceratopogoninae	8	12.31%
Orthocladinae	7	10.77%
Tanytarsus	6	9.23%
Psectrocladius	3	4.62%
Pseudochironomus	2	3.08%
Hvalella	2	3.08%
Chironomidae	2	3.08%
Perlotidae	1	1.54%
Paramerina	1	1.54%
Nanocladius	1	1.54%
Callibaetis	1	1.54%
Apedilum	1	1.54%

Functional Composition

Category	R	A	PRA
Predator	3	10	15.38%
Parasite			
Collector Gatherer	9	49	75.38%
Collector Filterer	1	6	9.23%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper			
Shredder			
Omnivore			
Unknown			

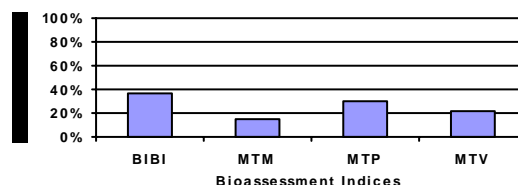


Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
<i>Composition</i>					
Taxa Richness	13	1	1		0
Non-Insect Percent	3.08%				
E Richness	1	1		0	
P Richness	1	1		1	
T Richness	0	1		0	
EPT Richness	2		0		0
EPT Percent	3.08%		0		0
Oligochaeta+Hirudinea Percent					
Baetidae/Ephemeroptera	1.000				
Hydropsychidae/Trichoptera	0.000				
<i>Dominance</i>					
Dominant Taxon Percent	18.46%		3		3
Dominant Taxa (2) Percent	32.31%				
Dominant Taxa (3) Percent	46.15%	5			
Dominant Taxa (10) Percent	92.31%				
<i>Diversity</i>					
Shannon H (loge)	2.189				
Shannon H (log2)	3.158		3		
Margalef D	2.981				
Simpson D	0.121				
Evenness	0.099				
<i>Function</i>					
Predator Richness	3		1		
Predator Percent	15.38%	3			
Filterer Richness	1				
Filterer Percent	9.23%			2	
Collector Percent	84.62%		1		0
Scraper+Shredder Percent	0.00%		0		0
Scraper/Filterer	0.000				
Scraper/Scraper+Filterer	0.000				
<i>Habit</i>					
Burrower Richness	3				
Burrower Percent	29.23%				
Swimmer Richness	1				
Swimmer Percent	1.54%				
Clinger Richness	2	1			
Clinger Percent	10.77%				
<i>Characteristics</i>					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	4				
Hemoglobin Bearer Percent	20.00%				
Air Breather Richness	0				
Air Breather Percent	0.00%				
<i>Voltinism</i>					
Univoltine Richness	3				
Semivoltine Richness	0	1			
Multivoltine Percent	83.08%		0		
<i>Tolerance</i>					
Sediment Tolerant Richness	0				
Sediment Tolerant Percent	0.00%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	3.474				
Pollution Sensitive Richness	0			0	
Pollution Tolerant Percent	20.00%	3		1	
Hilsenhoff Biotic Index	7.219		0		0
Intolerant Percent	1.54%				
Supertolerant Percent	44.62%				
CTQa	100.000				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	18	36.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	9	30.00%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	4	22.22%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	3	14.29%	Severe



Taxa Listing

Project ID: MDT07PBSJ
RAI No.: MDT07PBSJ005

RAI No.: MDT07PBSJ005

Sta. Name: Cloud Ranch Stream-Big Timber

Client ID:

Date Coll.: 7/24/2007

No. Jars: 1

STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Acari	1	1.79%	Yes	Unknown		5	PR
Ephemeroptera							
Baetidae							
<i>Callibaetis</i> sp.	1	1.79%	Yes	Larva		9	CG
Heptageniidae							
<i>Nixe</i> sp.	1	1.79%	Yes	Larva		4	SC
Plecoptera							
Chloroperlidae							
Chloroperlidae	1	1.79%	Yes	Larva	Early Instar	1	PR
Perlodidae							
<i>Isoperla</i> sp.	1	1.79%	Yes	Larva		2	PR
Trichoptera							
Brachycentridae							
<i>Brachycentrus americanus</i>	2	3.57%	Yes	Larva		1	CF
Hydroptilidae							
<i>Ochrotrichia</i> sp.	1	1.79%	Yes	Larva		4	PH
Lepidostomatidae							
<i>Lepidostoma</i> sp.	1	1.79%	No	Pupa		1	SH
<i>Lepidostoma</i> sp.	3	5.36%	Yes	Larva		1	SH
Uenoidae							
<i>Neophylax rickeri</i>	5	8.93%	Yes	Larva		3	SC
Coleoptera							
Elmidae							
<i>Optioservus</i> sp.	3	5.36%	Yes	Adult		5	SC
<i>Optioservus</i> sp.	3	5.36%	No	Larva		5	SC
Hydrophilidae							
Hydrophilidae	3	5.36%	No	Larva		5	PR
<i>Laccobius</i> sp.	2	3.57%	Yes	Adult		5	PR
Diptera							
Tipulidae							
<i>Cryptolabis</i> sp.	2	3.57%	Yes	Larva		11	SH
Tipulidae	1	1.79%	No	Larva	Damaged	3	SH

Friday, September 21, 2007

Taxa Listing

Project ID: MDT07PBSJ
RAI No.: MDT07PBSJ005

RAI No.: MDT07PBSJ005

Sta. Name: Cloud Ranch Stream-Big Timber

Client ID:

Date Coll.: 7/24/2007

No. Jars: 1

STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Chironomidae							
Chironomidae							
<i>Apedilum</i> sp.	2	3.57%	Yes	Larva		11	CG
Chironomidae	2	3.57%	No	Pupa		10	CG
<i>Cricotopus (Cricotopus)</i> sp.	2	3.57%	Yes	Larva		7	SH
<i>Heleniella</i> sp.	1	1.79%	Yes	Larva		6	CG
<i>Micropsectra</i> sp.	2	3.57%	Yes	Larva		4	CG
<i>Odontomesa</i> sp.	2	3.57%	Yes	Larva		4	CG
<i>Orthocladius</i> sp.	2	3.57%	Yes	Larva		6	CG
<i>Polypedilum</i> sp.	1	1.79%	Yes	Larva		6	SH
Potthastia Gaedii Gr.	4	7.14%	Yes	Larva		2	CG
<i>Rheocricotopus</i> sp.	2	3.57%	Yes	Larva		4	CG
<i>Thienemanniella</i> sp.	2	3.57%	Yes	Larva		6	CG
Thienemannimyia Gr.	3	5.36%	Yes	Larva		5	PR
Sample Count	56						

Metrics Report

Project ID: MDT07PBSJ
RAI No.: MDT07PBSJ005
Sta. Name: Cloud Ranch Stream-Big Timber
Client ID:
STORET ID:
Coll. Date: 7/24/2007

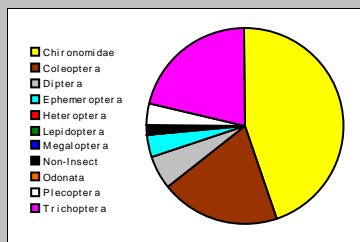
Abundance Measures

Sample Count: 56
Sample Abundance: 56.00 100.00% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	1	1	1.79%
Odonata			
Ephemeroptera	2	2	3.57%
Plecoptera	2	2	3.57%
Heteroptera			
Megaloptera			
Trichoptera	4	12	21.43%
Lepidoptera			
Coleoptera	2	11	19.64%
Diptera	1	3	5.36%
Chironomidae	11	25	44.64%

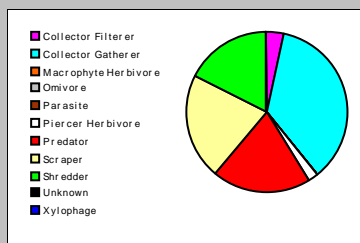


Dominant Taxa

Category	A	PRA
Optioservus	6	10.71%
Neophylax rickeri	5	8.93%
Potthastia Gaedii Gr.	4	7.14%
Lepidostoma	4	7.14%
Thienemannimyia Gr.	3	5.36%
Hydrophilidae	3	5.36%
Thienemanniella	2	3.57%
Rheocricotopus	2	3.57%
Orthocladus	2	3.57%
Odontomesa	2	3.57%
Microsectra	2	3.57%
Laccobius	2	3.57%
Chironomidae	2	3.57%
Brachycentrus americanus	2	3.57%
Apedilum	2	3.57%

Functional Composition

Category	R	A	PRA
Predator	5	11	19.64%
Parasite			
Collector Gatherer	9	20	35.71%
Collector Filterer	1	2	3.57%
Macrophyte Herbivore			
Piercer Herbivore	1	1	1.79%
Xylophage			
Scraper	3	12	21.43%
Shredder	4	10	17.86%
Omnivore			
Unknown			

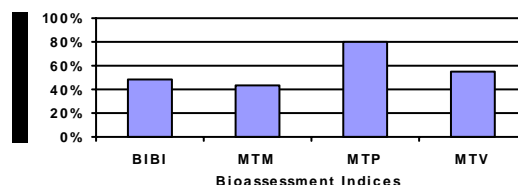


Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
<i>Composition</i>					
Taxa Richness	23	3	2		1
Non-Insect Percent	1.79%				
E Richness	2	1		1	
P Richness	2	1		2	
T Richness	4	1		2	
EPT Richness	8		2		0
EPT Percent	28.57%		1		0
Oligochaeta+Hirudinea Percent					
Baetidae/Ephemeroptera	0.500				
Hydropsychidae/Trichoptera	0.000				
<i>Dominance</i>					
Dominant Taxon Percent	10.71%		3		3
Dominant Taxa (2) Percent	19.64%				
Dominant Taxa (3) Percent	26.79%	5			
Dominant Taxa (10) Percent	58.93%				
<i>Diversity</i>					
Shannon H (loge)	3.017				
Shannon H (log2)	4.352		3		
Margalef D	5.746				
Simpson D	0.034				
Evenness	0.049				
<i>Function</i>					
Predator Richness	5		2		
Predator Percent	19.64%	3			
Filterer Richness	1				
Filterer Percent	3.57%			3	
Collector Percent	39.29%		3		3
Scraper+Shredder Percent	39.29%		3		1
Scraper/Filterer	6.000				
Scraper/Scraper+Filterer	0.857				
<i>Habit</i>					
Burrower Richness	1				
Burrower Percent	3.57%				
Swimmer Richness	1				
Swimmer Percent	1.79%				
Clinger Richness	7	1			
Clinger Percent	32.14%				
<i>Characteristics</i>					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	2				
Hemoglobin Bearer Percent	5.36%				
Air Breather Richness	2				
Air Breather Percent	14.29%				
<i>Voltinism</i>					
Univoltine Richness	6				
Semivoltine Richness	3	3			
Multivoltine Percent	50.00%		2		
<i>Tolerance</i>					
Sediment Tolerant Richness	0				
Sediment Tolerant Percent	1.79%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	4.000				
Pollution Sensitive Richness	1	1		1	
Pollution Tolerant Percent	14.29%	5		1	
Hilsenhoff Biotic Index	4.250		3		1
Intolerant Percent	21.43%				
Supertolerant Percent	5.36%				
CTQa	86.000				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	24	48.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	24	80.00%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	10	55.56%	Slight
MTM	Montana DEQ Mountains (Bukantis 1998)	9	42.86%	Moderate



Appendix G

U.S. ARMY CORP OF ENGINEERS PRELIMINARY WETLAND CREDIT ASSESSMENT

*MDT Wetland Mitigation Monitoring
Cloud Ranch
Big Timber, Montana*

**RECEIVED U.S. ARMY CORPS OF ENGINEERS**

OCT 31 2002

HELENA REGULATORY OFFICE
10 WEST 15TH STREET, SUITE 2200
HELENA, MONTANA 59626**ENVIRONMENTAL**REPLY TO
ATTENTION OF:

October 7, 2002

Helena Regulatory Office
Phone (406) 441-1375
Fax (406) 441-1380Subject: Corps File Number 2002-90-578
Heminway Property Wetland Project
Preliminary Wetland Credit AssessmentMr. Tom Coleman
Aquatic Design & Construction, Inc.
PO Box 582
Livingston, Montana 59047

Dear Mr. Coleman:

This letter is a response to your request that the US Army Corps of Engineers (Corps) concur with the crediting methods used to estimate the amount of wetland mitigation credit that may be generated by a proposed wetland project. The proposed work will occur on the Heminway property adjacent to the Big Timber Creek. The project is located near the community of Big Timber in Section 36, Township 3 North, Range 13 East, Sweetgrass County, Montana.

It is your intention to develop or restore, and then protect, wetlands at the site to provide compensatory wetland mitigation credit to the Montana Department of Transportation. It is required that all creditable areas be protected by a perpetual conservation easement or other encumbrance that ensures the continued existence of the aquatic lands and suitable buffers developed at the site. The following table summarizes the general amounts and types of wetland credit that the Corps will commit to, assuming that the site is constructed and develops as presented in your August 29, 2002 letter to this office.

Type of Mitigation Effort	Total Acres	Acres of Credit
Enhancement of Existing Wetland, 3:1 ratio	none	none
Creation of wetlands resulting from grading adjacent to restored or existing wetlands, 1:1 ratio	0.61 acres created	0.61 acres credit
Wetland restoration at sites of pond removal and pond embankment removals, 1:1 ratio	1.41 acres restored	1.41 acres credit
Riparian wetland restoration along Big Timber Creek channel project, 1:1 ratio	2.0 acres restored	2.0 acres credit
Emergent wetland restoration along Big Timber Creek channel project, 1:1 ratio	0.58 acres restored	0.58 acres credit
Allowable Buffer Zone, 4:1 ratio	3.58 acres upland buffer	0.89 acres credit
Summary of Potential Wetland Credit Available:	--	5.49 acres

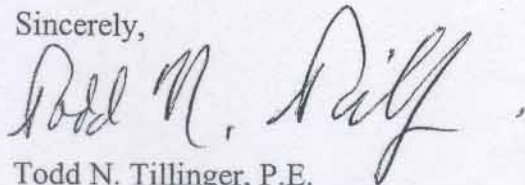
You will note that the amount of credit agreed to at this time was determined using ratios of compensation to impact rather than functional assessment. If necessary, the Corps will adjust the amount of mitigation credit acreage after the conclusion of the monitoring period.

Credit for wetland and upland buffer areas will only be awarded if livestock grazing is prohibited in those areas as a condition of the protective easement.

The monitoring period for this project will be five complete growing seasons after completion of construction and planting. If there are no appreciable changes expected after the fourth year of monitoring, the Corps may, upon request, waive the fifth year. Monitoring must be done in accordance with the protocols established under the MDT Wetland Mitigation Monitoring Program, with annual reports supplied to this office either as part of that program or as stand-alone submittals.

If you have any questions please contact me by phone at (406) 441-1375 or by e-mail at todd.n.tillinger@usace.army.mil, and reference Corps File Number 2002-90-578.

Sincerely,

A handwritten signature in black ink, appearing to read "Todd N. Tillinger". The signature is fluid and cursive, with a large, stylized "T" and "N".

Todd N. Tillinger, P.E.
Project Manager

CC: Larry Urban, Montana Department of Transportation - Environmental Services